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PUDENDAL BLOCK ANESTHESIA IN OBSTETRICS*

J. R. HARRIS, JR., M.D., LUBBOCK, TEXAS

IT IS now well over a century since Sir James Simpson introduced the factor of anesthesia in the conduct of vaginal delivery, and over fifty years since the initial efforts were made to give analgesia for the pains of labor. Analgesia and anesthesia continue to this day to be the most widely discussed and the most controversial problem in obstetrics. Unfortunately, the problem is still far from an ideal, universally acceptable solution. One reason for this is obviously the presence of the awkward situation of attempting to administer to two individuals, the mother and the fetus at the same time, and still not interfere with the normal mechanism of labor. Complicating the situation further is the wide variation in the length of time analgesia and/or anesthesia may be needed in each individual case. Finally, there is the extreme range of emotional response a particular gravid woman may demonstrate, dependent upon many factors, such as previous unpleasant experiences, childhood training, emotional immaturity, low pain threshold, and lack of confidence in her attending physican.

The general public is fully aware of the professional dissatisfaction with the present combinations of obstetric analgesia and anesthesia. This is evidenced by the fact that one of the most common questions asked during the prenatal period is, "Doctor, what type of anesthetic do you use?" In the discussion that follows the patient usually makes it known that she has very definite ideas of what she wants, based on previous experiences of friends and

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relatives, and more particularly the information that has been gained from reading sensational articles in the lay press. It is my opinion that the recent popularity of Read's *Natural Childbirth* is a product of the patient's general dissatisfaction, and an attempt on her part to secure more emotional support from her physician during pregnancy and labor. As Eastman has repeatedly pointed out, the frugality of emotional support given by the average obstetrician is the greatest weakness in American obstetrics today.

It is not the purpose of this paper to review long lists of drugs which have been used to relieve pain and distress during labor and delivery. Their various virtues and shortcomings are all too familiar. It is, however, worthwhile to commend the current practice of using analgesic drugs in progressively decreasing amounts as our experience and understanding grow.

In trying to evaluate analgesic drugs, three factors must be considered: (1) the efficiency of the drug to relieve pain for the mother, (2) the margin of safety for the fetus, and (3) the inherent property of the drug to accomplish the first two objectives and still allow the patient to remain a calm, rational, cooperative individual. There are at present numerous analgesic agents which completely fulfill the first two objectives and partially accomplish the third. Closely associated with this third objective of analgesia is the doctor-patient relationship formed during the prenatal period, without which no drug should be expected to fulfill its maximum potentialities. From a broad viewpoint then, modern obstetric analgesia leaves little to be desired, but unfortunately the same cannot be said of obstetric anesthesia.

The evaluation of anesthetic agents must, of course, include the same factors as those of analgesia. In addition other factors present themselves, such as: (1) effect upon the labor mechanism, (2) morbidity and mortality that are solely due to the anesthetic agent, and (3) selective ability to relax the birth canal and the perineal structures. Let us consider the anesthetic agents in general groups rather than individually, in order to avoid repetition and to conserve time for more profitable discussion. Anesthetic agents, then, fall into three main categories: (1) general, (2) spinal, including "caudal" and "saddle block," (3) regional and local infiltration. The disadvantages of each of these groups can be summarized briefly:

1. General Anesthetics:

a. Risk of postanesthetic pneumonia and other pulmonary complications, notably aspiration pneumonitis.

b. Dehydration, acidosis, and shock, which are common after prolonged anesthesia.

c. Toxic effects of some agents upon the liver and other vital organs.

d. Frequent gastrointestinal disturbances following this type of anesthesia.

e. Necessity for the constant supervision of a trained anesthetist.

f. Inability of the patient to assist in her delivery and the increase of operative obstetrics.

g. Frequent interference with the mechanism of labor.

h. General unpleasantness experienced by the patient.

2. Spinal Anesthetics:

a. The definite mortality accompanying its use, and many "close calls."

b. The incidence of pulmonary complications which is as high as with general anesthesia.

c. A definite toxic effect upon the spinal cord and nerve roots, as evidenced by many recent reports of paralysis.

d. Frequent pronounced drop in blood pressure, endangering both mother and fetus.

e. Frequent postanesthetic headaches.

f. The peculiar susceptibility of pregnant women to the common complications of spinal anesthesia.

g. Necessity of the constant supervision of a competent trained anesthetist.

h. The fear of most people of a "spinal" injection.

3. Regional or Local Anesthetics:

a. Infection of skin near site of injection which eliminates its use.

b. Unpleasantness of preliminary injections.

c. Sensitization to procaine and related drugs.

d. Psychotic, or abnormally excited patients.

e. Failure of the method to relieve fundal or upper abdominal distress.

Merely from the comparison of disadvantages it is readily seen that the latter method is much preferable. The advocates of block anesthesia are the most enthusiastic group of obstetricians I know, but their number is small. This limited number is due to a considerable extent to three reasons: (1) the task of administering the other anesthetics can be delegated to someone else; (2) there is the necessity of learning a new technique and considerable experience is required before becoming proficient in it; and (3) the method requires, for maximum effect, a close relationship between patient and physician, a condition which is too time consuming for the average busy obstetrician.

The advantages to be gained by wider usage of local anesthetics in obstetrics are so numerous that is quite amazing that the various methods have not gained more popularity in the past. Looking through textbooks on anesthesia one is surprised to find only an obscure paragraph or short reference on pudendal block, or a vague description of technique which in most instances is not truly a pudendal block, but a "diamond block," or local infiltration of the perineal structures. Anyone who follows the technique usually described is fortunate to get as much as 50 per cent anesthesia in the area desired. Last year Klink reported in detail a method of injection of the pudendal nerve that I recommend most highly to all who are interested in regional anesthesia.

Greenhill has been like "a voice crying in the wilderness," advocating local anesthesia for decades; many heard, but few heeded. Like so many others I was finally forced into trying pudendal block anesthesia by a series of circumstances rather than by rational thinking. After the nursing personnel and particularly trained anesthetists gradually became depleted in my area, and because of the frequent fads that invade the medical profession, I tried caudal, spinal, saddle block, and finally Trilene inhalation alone. These

experiences left much to be desired, and the fact remained that I was still forced to provide suitable anesthesia in the majority of my cases. Three other physicians in my community reached the same conclusion, and we started pudendal block as a routine anesthetic independently of each other in 1952. During the trial-and-error initial period our feelings about pudendal block were mixed, but two years and well over two thousand cases later we have emerged unanimous in our praise of the method.

In the beginning various agents were tried, namely, procaine, Metycaine, and Xylocaine, with and without hyaluronidase, with the additional use of Trilene inhalation routinely. Finally, as experience grew, hyaluronidase was eliminated altogether and supplementary light inhalation anesthesia was used only occasionally during the period of injection and for unusually excited patients.

This paper deals with the results of 700 consecutive deliveries during 1952-1953, with the use of pudendal block anesthesia, supplemented in some cases with Trilene inhalation. Although it presents nothing new, certainly no panacea for all the ills of obstetric anesthesia, it does demonstrate the partial solution of one of our problems and should be in the armamentarium of all obstetricians, particularly those who are not constantly served by competent anesthetists. Analgesia in all cases was limited to Demerol (50 to 100 mg.) and scopolamine (1/300 to 1/150 grain and in a few cases to Carbrital (1½ to 3 grains). In the vast majority of cases the minimal dosage indicated was used.

One criticism of the method occasionally heard is that it is suitable only for the grand multipara, who needs but little help to produce her young, but this is not true in my series (Table I).

TABLE I. SEVEN HUNDRED CONSECUTIVE DELIVERIES, 1952-1953

	NO.	PER CENT
Primiparas	225	32
Multiparas	475	68
Para i and ii	405	85
Para iii and over	70	15
Previous episiotomy	386	81

The distribution of types of presentation in this series was found to be not unusual as is indicated in Table II.

TABLE II. TYPES OF PRESENTATION IN 700 CONSECUTIVE DELIVERIES, 1952-1953

PRESENTATION	NO.	PER CENT
Cephalic, anterior	406	58
Cephalic, posterior	251	36
Breech, all types	43	6

An interesting feature with this type of anesthesia, which produces marked relaxation of the lower birth canal, was the spontaneous rotation of 82 per cent of the posterior presentations in a very few minutes after the beginning of the second stage of labor.

An attempt was made to "grade" the anesthesia obtained in this series with the following result (Table III).

TABLE III. RESULTS OF PUDENTAL BLOCK, 1952-1953

	GOOD	FAIR	POOR
1952 (307 cases)	246	39	22*
1953 (393 cases)	362	29	2†

*It should be noted that the majority of cases classified as "poor" occurred in the early days when experience of the operator was also "poor."

†In both cases classified as "poor" in 1953, it was discovered on investigation that the solution used for injection had been normal saline rather than Novocain.

In none of the cases classified as "fair" was it necessary to supplement the anesthesia with anything other than Trilene inhalation. It should also be noted that in these cases, even though complete pain relief was not obtained, good relaxation of the muscular structures was evident.

Time does not allow for complete tabulation of all of the good results obtained from this method, but several must be mentioned: the shortening of the second stage of labor, the marked lowering of the necessity for operative obstetrics, which in turn lowered the maternal and fetal morbidity, the excellent condition of the newborn, the simplicity of the method, the almost uniformly good results, and finally the lack of necessity of a large number of assistants.

Summary

Seven hundred consecutive deliveries with the use of pudendal block anesthesia have been reviewed. A brief comparison of the more common types of obstetric anesthesia has been given and the advantages of pudendal block emphasized, mainly its effectiveness and simplicity. In combination with Trilene inhalation and mild analgesia its field of usefulness has been extended to include practically all modern obstetric procedures. No panacea for all the ills of obstetric anesthesia is offered, but this extremely useful adjunct should be in the armamentarium of every obstetrician, particularly those plagued with the ever-growing shortage of trained assistants.

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1211 AVENUE O,
LUBBOCK, TEXAS

THE EMOTIONAL COMPONENT IN TRICHOMONAS VAGINITIS*

S. Foster Moore, Jr., M.D., and John W. Simpson, Colonel, MC, USA,
San Antonio, Texas

TRICHOMONAS vaginitis continues to be one of the most annoying problems in gynecologic practice, both to the physician and to the afflicted patient. This is especially true of the chronic and recurrent form of the disease such as is seen in the individual who frequents the office of first one and then another physician seeking relief. Unfortunately, not a great deal has been contributed toward the practical management of this condition, even though new medicinal agents for the local treatment of the disease are being introduced almost daily. It is reasonable to assume that no agent intended for local use ever will solve the problem. We might conclude, in fact, that the solution will lie neither in local treatment aimed at eradication of the infectious agent nor in unrealistic measures intended to prevent reinfection. Rather, it probably will be found by changing those conditions which must exist to make the patient prone to infection.

It has been assumed for some time that altered vaginal physiology favoring the growth and multiplication of Trichomonas and the subsequent development of symptoms occurred in certain individuals. Just what these physiologic changes may be are not known; nor is there at present any certain knowledge of what contributes to these changes.

Psychologic Concept

We believe that Trichomonas vaginitis is a psychosomatic symptom which occurs as a result of changes in the vaginal physiology which are produced by emotional stress. Such a theory accepts the trichomonad as the specific infectious agent, but holds that the organism is incapable of producing symptoms except when the vagina is conditioned by the effects of disturbed emotions. We are, therefore, directly relating the emotions to the precipitating cause of the disease. This concept is based upon the observation that symptomatic vaginal infestation with Trichomonas invariably is associated with a significant degree of emotional stress, and that such stress precedes the onset of symptoms. Furthermore, we believe that Trichomonas vaginitis rarely occurs independently of other symptoms of a psychosomatic nature. In addition to this theory concerning the cause of the condition, we suggest a method of management which has been successful in our hands and which should be generally useful.

In the studies that have been made of psychosomatic disease in other areas of medicine, as well as in the field of psychosomatic gynecology,[1, 2, 3]

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there is ample basis for this concept of Trichomonas vaginitis as an emotionally conditioned disease. Numerous observers have included leukorrhea among the psychosomatic gynecologic disorders, but none specifically has included Trichomonas vaginitis in this category. At the same time, it has been noted repeatedly that Trichomonas vaginitis often is associated with disorders of the emotions. Galloway,[4] for instance, suggested that a "psychological" condition may exist in some of the recurrent cases of Trichomonas vaginitis, and Greenhill[4] noted that recurrences were prone to occur in what he called "high-strung" women. Mayer (quoted by Kroger and Freed[5]) studied a series of 100 cases of leukorrhea due to *Trichomonas vaginalis* and found that the overwhelming majority of the women were frigid, indicating, he felt, emotional conflicts of a sexual nature.

Physiologic Evidence

Physiologic evidence supporting our concept of Trichomonas vaginitis as an emotionally conditioned disease is found in the work of Wolff.[6] He has shown that psychobiologic stress can produce severe disorders of function by the activation of what he calls the "protective reaction pattern" of response. Particularly, he has noted that the mucosal surfaces of the body undergo changes in individuals under stress characterized by vasodilation, turgescence, and hypersecretion. A suggestion as to the possible psychophysiologic changes which might occur in the vagina in response to stress may be contained in the observations of Taylor and Duncan.[7] These investigators, in a study of the psychologic background of 36 patients with what they call "pelvic congestion," noted a correlation between emotional changes during interview with some of these patients and variations in the blood flow of the vaginal wall, as demonstrated by continuous recording of changes in the vaginal temperature. We are at present undertaking studies of this sort in patients with vaginal trichomoniasis, including both those who have symptoms and those who do not have symptoms. By these studies we hope to determine whether or not patients with symptomatic infestations might demonstrate significant alterations of blood flow through the vaginal wall.

Emotional disturbance in the patient with Trichomonas vaginitis usually is obvious. This is revealed during interview by her manner in general and by her specific attitudes toward her presenting symptom, expressed in terms of anxiety or resentment or both. A carefully taken history, in most cases, will elicit one or more other symptoms characteristic of disordered emotion. These may be nervousness, fatigue, weight changes, sleep disturbances, digestive disorders, headache, menstrual irregularities, or painful breasts, to mention only a few of the more common. Psychosexual disorders almost invariably are present, and these often include frigidity as well as dyspareunia. It is notable that these patients much prefer to discuss their "discharge and itching" rather than these other symptoms, and therefore a casual or hastily taken history usually will fail entirely to disclose the presence of these other important physiologic evidences of a tension state.

Personality Structure

Study of the psychologic background of patients with Trichomonas vaginitis indicates that the personality differs in no great respect from that noted in women presenting themselves with other psychosomatic symptoms. Several observers[8] have noted in patients with psychogynecologic disorders features which have been prominent in our patients with Trichomonas vaginitis; namely, an immature dependent personality covered, so to speak, by strong dominant drives and an outward aggression, giving the patient an appearance denying her real psychological makeup. This is not to say that all patients with Trichomonas vaginitis are emotionally inadequate. We have observed the symptom in women whom we believed to be reasonably adequate and reasonably mature, but only when they were subjected to extreme degrees of stress. It follows simply that the better the psychologic background of the individual, the more strain she will be able to withstand before symptoms are produced.

Nature of Stress

It appears from our observation that a very considerable degree of external pressure must be applied to the average woman before physiologic adaptation favoring the development of Trichomonas vaginitis occurs. Many of these patients have real problems involving threats of a serious nature. In others the threats are less material, but when reacted to in terms of previous experience, the response is no less severe. Any type of stressful situation seems capable of evoking this physiologic response if sustained sufficiently long, or if of great enough intensity. Such situations may have to do with the problems of everyday living and may as likely be concerned with the socioeconomic aspects of the patient's environment as with sex. What *is* important is that marked emotional discomfort is present in almost all cases, and in the really intractable case one often finds that the patient is loaded with a tremendous emotional burden.

Treatment

Our method of managing Trichomonas vaginitis primarily is concerned with the emotional component of the condition, but of course includes other measures. Treatment actually begins with the taking of the patient's history, and much will be gained if she is encouraged to talk freely and tell her story in her own way. If the interview is hurried, or if the patient is merely allowed to answer those questions necessary to complete a form type of history, an excellent opportunity to establish necessary rapport will be lost. Leading questions relating to the patient's emotional state are avoided at the time of the initial interview, but any remarks which she may make concerning the cause of her symptoms are noted. Often this suffices because in many cases the situation contributing to the stress is of a temporary nature, and time works in behalf of the patient. Adequate support in such instances is all that is necessary to enable the patient to resolve her tensions. We rarely conclude this part of the visit without asking the direct question, "Is there anything else which you feel that I should know about you?" It is surprising how revealing the response to this question may be.

Physical examination is the same as that of a patient presenting herself with any other gynecologic complaint. It should be thorough enough to convince the patient that the examiner is interested in her as a whole person. Diagnosis can be made in most instances by inspection of the vulva and vagina, but the presence of the trichomonad is confirmed by microscopic examination of the fresh material collected on the lower blade of the speculum. If the patient has douched shortly before being examined, the organism may not be found, in which case no local treatment is used, and she is asked to return in a few days for another examination. We believe that the importance of establishing the diagnosis beyond any doubt justifies this short delay. Furthermore, this will impress upon the patient the thoroughness and interest of the examiner and will give her additional confidence.

As soon as the diagnosis is established, some form of local treatment is used. This is not essential to the patient's ultimate recovery, and we have successfully managed a number of cases with no local therapy at all, but it does provide her with prompt relief of the discharge and itching, and again is a means of establishing confidence. In the majority of cases, the patient receives no more than one or two local treatments in the office, although we may prescribe some agent which she can use at home. We consider it important to keep local symptomatic therapy to a minimum, not only to avoid fixing the patient's attention on her vaginal symptoms, but also to avoid having her feel that we expect it to play any significant role in her ultimate cure. Furthermore, from a purely somatic viewpoint, some of her discomfort at the time she presents herself may actually be due to previous overtreatment.

The manner in which these patients are approached psychologically is all important. If the vaginitis is chronic or recurrent and has proved resistant to treatment by other physicians, the patient may have come to regard it as incurable and may have lost confidence in all doctors. This probably accounts for the degree of passive hostility which some of these patients display initially, and which may make them difficult to manage. Because these patients often have fears not related to their physical condition, they frequently appear to have an undue amount of anxiety centered upon their symptom. This may be expressed in terms of fear of venereal disease, fear of cancer, fear of offensive odor, or they may *feel* these things without expressing them. These are some of the emotional aspects of the condition which must be considered in its treatment.

It is important to keep these patients emotionally comfortable concerning the disease while they are under treatment. We begin our definitive treatment by reassuring the patient. We do not hesitate to use the word "cure" because we feel that we can and do cure almost all of these cases. We explain that the local symptoms are due to the presence and multiplication of the trichomonads in the vagina and say whatever else seems appropriate about the nature of the condition. We next tell the patient directly, being careful to avoid a tone of accusation, that the symptoms are made possible through the effect of nervous tension acting upon the body. This explanation may be expanded as much as the patient's understanding and receptiveness will permit. We feel perfectly safe in assuming this tension to be present even when the initial discussion fails to reveal it, and in very few instances will the patient deny that tension exists. In fact, this often opens an avenue of verbalization that is most revealing, and has much therapeutic value as well. In those few instances in which the individual rejects the idea that she may be "nervous," it is better not to press the point during the first few interviews. At subsequent visits, tactful approaches to the subject usually will succeed if the physician has convinced the patient that he is genuinely interested in her problems.

After a few visits, attention is directed away from the vaginitis, but if symptoms are not completely relieved local treatment may be repeated a few more times. Our psychotherapeutic technique necessarily is simple. We initially provide emotional support, encourage free expression of feeling, and give the patient an opportunity to express her concept of the meaning of her symptoms. Just how far the gynecologist should proceed with his psychotherapy will depend upon his ability along this line, his experience, and his interest. Our own aim is to give the patient insight into the nature of her symptoms and to provide some degree of re-education. In most instances we can proceed along this line rather rapidly with gratifying results. Our type of therapy has very definite limitations of course. Occasionally we will encounter an emotional condition which we are not equipped to handle or for some reason or other we may fail to get satisfactory results. In these cases, we direct the patient's thinking toward securing more complete psychotherapy. Usually she herself will begin to "wonder" if she should not go to a psychiatrist. When transference takes place in this manner, the ultimate result is good, and psychiatrists have cured some of our most resistant cases.

In addition to psychotherapy and a minimal amount of local treatment, other measures of a supportive nature are valuable. These consist of sedation, daily periods of rest with general decrease of physical activity, and abstinence from sexual intercourse. Sedatives are especially useful, and almost all of our patients are given some form of phenobarbital during the early part of their treatment. A disproportionate number of our patients with chronic Trichomonas vaginitis are employed wives who work some fourteen or fifteen hours a day, including time spent at their household chores. These overextended women we encourage to give up their jobs or obtain help with their home duties. At the onset of treatment, especially if the vaginitis is acute, abstinence from sexual intercourse is advised. This advice relieves the patient of her feelings of guilt in connection with denying her husband and in general makes for smoother relations in this matter. Later, after symptoms have subsided and intercourse is resumed, it is suggested that for a few weeks the husband should use a condom. This is because there is a possibility that the male may harbor the organism for a short time and perhaps could reinfect the patient before she has had time to develop resistance to it.

Results of Treatment

Our results in the treatment of Trichomonas vaginitis have improved immeasurably since we have managed it as a psychosomatic symptom. We have not been successful in all cases, of course, but recurrences are far less frequent than when we were treating the condition on a purely somatic basis. What is more important is that the patient is more comfortable in every way. No less important is our feeling that we know what we are treating and how to go about it, and we are no longer frustrated as physicians.

Summary

1. The theory that Trichomonas vaginitis, particularly in its chronic recurrent form, is an emotionally conditioned disease is offered.

2. Symptomatic infestations with *Trichomonas vaginalis* occur only in patients suffering from a significant degree of psychobiologic stress.

3. As a result of this psychobiologic stress, undetermined physiologic alterations occur in the vagina, predisposing it to the development of symptomatic Trichomonas vaginitis.

4. A method of treatment is suggested based upon a psychologic approach in keeping with the concept that the disease is essentially psychosomatic in nature.

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401 W. SUMMIT,
SAN ANTONIO, TEXAS

Discussion

COLONEL JOHN W. SIMPSON.—Our medical literature is largely concerned with the unusual diseases, the big operations, oddities, and serious illnesses. It is high time for us to turn to the relatively minor but more important illnesses such as Trichomonas vaginitis. I happen to work in a fairly large clinic where much extensive surgery is performed, but our emphasis is placed on the importance of the day-to-day patient and the minor—by comparison—illnesses. I have been associated with Dr. Moore for some time and thoroughly respect his sound judgment and ability. He often makes off-handed remarks about various illnesses and procedures merely to "needle" our resident staff. I first thought his reference to the emotional component of Trichomonas vaginitis was one of these "needling remarks." However, I soon realized that he had made an important observation and that it merited further study. We are late indeed in realizing the analogy between irritative lesions of the vagina and those of the skin. The psychogenic factor in dermatologic lesions of many types has long been recognized. The epithelium of the vagina is squamous epithelium, and it is not properly a mucosal surface. It is in most ways similar to skin, and the same psychobiologic influences act upon it as upon the skin.

In considering the problem, we realized that little is known about the physiology of the vagina. The vaginal temperature in relation to atmospheric temperature, oral temperature, and skin temperature at different periods in life and even on different days of the menstrual cycle is unknown. A few scattered observations have been made, but they are essentially valueless. We are undertaking a critical study of the vaginal temperature in normal women for long periods of time. We will also study women with Trichomonas vaginitis, atrophic vaginitis, pelvic neurosis, etc. This will be correlated closely with the variations in the hydrogen ion concentrations to be taken at the same time. We hope this will give us some indications as to whether there exists vaginal hyperemia or pelvic congestion. We want to know if changes in the bacterial and protozoal flora cause alterations in the blood flow and therefore in temperature. We would also like to know what relationship exists between the psyche and blood flow through the pelvis and vaginal lining. When we cure or relieve a case of vaginitis, is there a resultant alteration in vaginal temperature?

In addition to the psychologic approach to the management of these cases, we are using a free alcohol of hydrocortisone in a Carbowax base which has been prepared for us by Pfizer. The symptomatic relief from this drug is prompt and complete. We do not yet know how long the relief lasts, but it may give the patient surcease while her psychobiologic tensions are being relieved.

DR. WALTER S. MORSE.—When one routinely employs vaginal smears on all gynecologic patients, not infrequently a patient is encountered whose smear is loaded with trichomonads and yet who is without the characteristic symptoms. Furthermore, some of our braver colleagues have inoculated healthy vaginas with pure cultures of *Trichomonas vaginalis* organisms without producing the disease or its symptoms. The bacterial flora of

the vagina is essentially the same in Trichomonas vaginitis as in the normal vagina. Consequently, there must be some factor or factors other than the presence of the trichomonads responsible for the disease and its perpetuation.

It is trite to mention that in the management of any patient we must be aware that we are dealing with at least two components: namely, physical and emotional. Yet we often seem to be disconcerted when confronted by such intangible elements as emotions, and prefer to concentrate on physiologic details. Unfortunately, many of us are reluctant to accept psychosomatic concepts. This is particularly true when dealing with a previously well-established physical entity such as Trichomonas vaginitis. I am sure many of us recall patients with this infection who were treated with numerous accepted routines and trichomonacides. In view of what has been said, however, one must realize that there may be an emotional component which probably prevented a cure. This emotional element is more than the anxiety which accompanies the "itch," urinary frequency, urgency, or dysuria.

Trichomonas vaginitis is a local infection which may be accompanied by an emotional component. This cannot be disputed. Because of this psychogenic factor, as the authors emphasize, the disease is often resistant to the customary gynecologic treatment. There are many methods and trichomonacides available for the treatment of the local infestation, all of which have varying degrees of therapeutic merit. Persistence and thoroughness without over-treatment, however, as the essayists advise, should be stressed.

The authors should be complimented for bringing to our attention this important and thought-provoking aspect concerning the management of Trichomonas vaginitis.

INDUCTION OF LABOR*

CHARLES RONALD STRAGHAN MACKENZIE, M.D., GALVESTON, TEXAS

(From the Department of Obstetrics and Gynecology, The University of Texas Medical Branch, Galveston)

THE problem of induction of labor is frequently faced by everyone who practices obstetrics. The majority confine the practice to cases in which there is some specific indication, either maternal or fetal. There are some, however, who induce labor electively, feeling that certain patients are better served in this manner.

Today it is planned to discuss briefly the three following aspects of the problem:

1. Some of the commoner methods of induction and the present-day opinion concerning them.
2. The elective induction of labor.
3. Induction when a specific indication exists.

I. Methods of Inducing Labor

The exact physiologic mechanism for the spontaneous induction of labor is not yet known. For this reason attempts at induction are empirical. It is known for example that, when the cervix is ripe, simple rupture of the membranes is a highly successful procedure. No one mechanism, however, has completely answered the problem. When conditions arise which call for early or immediate delivery in the presence of a thick undilated cervix, the safe induction of labor becomes a major problem. According to Tenney the trend is toward conservatism with patients not at term, "to treat the complication and temporize with the actual induction until it can be safely performed." For cases requiring prompt delivery before the cervix is ripe for induction, he recommends cesarean section.

Some of the more frequently used methods of the past and present will be given brief discussion:

1. Bougies, Rectal Tubes, Catheters and Packs.—

These methods have fallen into general disfavor throughout the United States and Canada and are rarely used any longer. Obstetricians believe that the risk of infection is too great for so unreliable a procedure. In addition, bleeding from a low-lying placenta has occurred. Danforth states that these methods have no place in the obstetrics of today.

2. Bags.—

These are still used on occasion. Operators who use bag induction must face such complications as prolapse of the cord, displacement of the presenting part, compound presentation, and the introduction of infection. In general, physicians believe that this method holds too small a margin of safety and that there are better means at hand to obtain the same end. In fairness it must be said that bag induction may have a small part in placenta previa when delivery from below is chosen.

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3. Quinine.—

This drug, once widely used, is chiefly of historical interest now. It is generally conceded that quinine is of little or no value in the induction of labor. Not only is it unreliable but a number of fetal abnormalities, especially eighth-nerve damage, have been attributed to it. Quinine has now fallen into almost total disuse.

4. Castor Oil.—

There appears to be some controversy about the efficacy of this compound. Danforth writes, "Quinine and castor oil have had their day and are happily on their way to oblivion." Dieckmann and McCready have discontinued castor oil because they feel it is of no value. Others have written that it is extremely unpalatable to the patient and so unreliable that it has been discontinued in their practices. Stein, however, writes that it is a highly effective drug if given at the proper moment. He says that when labor is imminent and the cervix is ripe, castor oil is effective, no other procedures being necessary. In this hospital we use castor oil combined with a large hot enema frequently to act as the trigger mechanism in the onset of imminent labor and are quite satisfied with our results. We do not rupture membranes routinely in this type of patient.

5. Calcium Gluconate.—

As calcium is an effective stimulant of uterine contractility, calcium gluconate intravenously has been used by some. Pituitary extract is usually given with this drug. The exact mechanism of action of the small 10 c.c. dose usually given is not known. Grier has formed a distinct clinical impression that it is useful and uses it combined with a hot soapsuds enema and artificial rupture of membranes in all his cases for elective induction. Then, if labor has not started after two hours, stimulation of uterine contractions with intramuscular Pitocin is begun.

6. Rupture of the Membranes.—

This is the most important single procedure for the induction of labor. Moreover, the success achieved by other methods is enhanced when rupture of the membranes is included. Stripping of the membranes has been recommended prior to their rupture, but this appears to be of doubtful value and in addition increases the risk of infection. Success with this method depends on the degree of ripeness of the cervix. A thick undilated cervix usually means a protracted latent period before the onset of labor. This delay may defeat the purpose of the induction. The question of morbidity also presents itself. Lemmon and others believe that there is an increase in maternal morbidity with prolongation of this latent period. He states that a prolonged latent period increases the fetal morbidity and mortality, and recommends both antibiotics and medicinal stimulation to shorten this period of waiting. There is much controversy over the value of antibiotics in premature rupture of the membranes. Some authorities believe that there is no increased fetal risk in such cases. On the other hand, Calkins, in his paper on spontaneous premature rupture of the membranes, stated that, by the most conservative judgment, the fetal loss "is at least three times as high when the lag period is over twenty-four hours." Pneumonia and prolapse of the cord account for most of this fetal loss. He advises that penicillin alone or in combination with other antibiotics be used in such cases. Bartholomew has shown that Neopenil and procaine penicillin give satisfactory cord levels over a twenty-four-hour period. It seems, therefore, a good plan to use antibiotics routinely in all cases of prolonged rupture of the membranes.

Not only should the cervix be ripe, but the head should be well into the pelvis before rupture of the membranes can be safely performed. Most obstetricians would rather perform a cesarean section than attempt to rupture membranes in the presence of a floating head. Reycraft recommends displacing the presenting part upward slightly to allow the escape of some of the amniotic fluid. This maneuver ought to be done with considerable caution.

With regard to the procedure, it has been suggested that rupture be accomplished with some type of perforating instrument, for example, a dressing forceps, guided by a finger in the rectum. This refinement in technique appears unnecessary as rupture of

membranes per vaginam performed under sterile conditions carries no increase in morbidity. In addition, it is a safer technique for the occasional operator.

7. *Pituitary Extract.*—

It was not until the turn of the century that Pituitrin was first used in labor. After this it rapidly became popular and was widely used even when there was no indication. Soon reports of disaster for both mother and child became so numerous that the drug was condemned. The need for a reliable agent for the safe induction of labor and the treatment of primary uterine inertia was so great that the problem was taken up again. The lack of standardization of the drug, the use of too large doses, and the lack of knowledge of indications and contraindications were undoubtedly responsible for most of the accidents.

Certain advances have made the use of pituitrin safer: (a) standardization of pituitary extract, (b) isolation of Pitocin, (c) the use of Pitocin via the intranasal route, and (d) the elimination of many of the dangers and inadequacies by diluting the drug and giving it by intravenous drip. If Pituitrin is used, 15 minims in 500 c.c. of 5 per cent glucose and saline is started at about 15 to 30 drops per minute. With Pitocin, 5 minims in 500 c.c. of 5 per cent glucose and saline or 10 minims in 1,000 c.c. of 5 per cent glucose and saline is usually given intravenously at a rate of about 15 to 30 drops per minute. The rate of flow is governed by the response of the uterus. At the first sign of uterine contractions the drug should be stopped and the patient watched carefully. Frequently that is all that is necessary and labor will progress uneventfully. On the other hand, contractions may stop and it will become necessary to start the drip again.

In hypertensive states Pitocin is preferred and the diluent should not contain saline.

Contraindications to the use of Pitocin are: (a) borderline or contracted pelves (These should be rigidly excluded as well as those cases in which some complication has made evaluation of the pelvic capacity difficult or inadequate.); (b) High multiparity, especially with a large fetus; (c) Previous uterine scar, for example, those following cesarean section, hysterotomy, and myomectomy; (d) large fetus in breech presentation; (e) twins with overdistention of the uterus and intact membranes; (f) abnormal presentation; (g) maternal exhaustion; (h) generally poor physical condition of the patient; (i) doubt as to the indications, in which case it is better to err on the side of conservatism and not use Pitocin.

When pituitary extract is used, especially by the intravenous route, the physician must remain at the bedside at all times, checking on the uterine contractions and the change, if any, in the fetal heartbeat. The drug is not advocated for use by the occasional operator. Excellent results can be obtained but only in properly selected cases.

Persistence in giving the drug when its effectiveness is not obvious after a few hours is contraindicated, and its use in poorly selected cases can be disastrous.

II. Elective Induction

There is no doubt that the onset of labor is frequently ill timed. It would be an ideal arrangement if the obstetrician could have his patient enter the hospital at an appointed time, and begin her labor at the most suitable moment. Some doctors are of the opinion now that, although this is not applicable to all, there is a certain group of carefully selected patients in whom induction of labor at such a time can safely be performed. It is of prime importance, of course, that the procedure should not endanger the safety of the mother or the child.

Among the advantages to be gained by elective induction are the following: (1) Fears of death from anesthesia or morbidity from aspiration of stomach contents are avoided. (2) The dangers of precipitate labor outside the hospital are eliminated.

(3) Apprehension is relieved, especially for those who live far from the hospital or who have poor transportation facilities. (4) Supervision of labor is more thorough than at night when only a skeleton staff is in control.

The selection of the patients for the elective induction of labor is the most important factor. The more rigid and careful the selection, the better the results. According to Grier, the following conditions should be present before this procedure is attempted: (1) There should be no cephalopelvic disproportion. (2) The baby should be mature and should preferably present by the vertex. (3) The fetal head should be engaged or dipping well into the pelvis. It should not be floating or ballotable. It is believed that if the presenting part is fitting well into the lower uterine segment, prolapse of the cord is almost impossible. (4) The cervix should be soft, partially effaced, and dilated at least 1 cm. In other words, it should be "ripe."

Erving adds that the patient should be multiparous. He feels that there is no reason for induction of labor in primiparas, except in the occasional case, because the pattern of labor and the size of the passenger which the pelvis will accommodate are not known. Others would limit such elective induction to vertex presentations only, feeling that the poor fit between the breech and the pelvis predisposes toward prolapse of the cord.

The ripeness of the cervix is the one most important factor in the selection of the cases. If the cervix is ripe, induction of labor will be successful in almost all the cases. Greenhill states that, regardless of a woman's calculation of the date of the last period, she is not at term if the cervix is not partly effaced and dilated. The reverse of this however is not true, as the cervix can appear quite ripe and yet the baby may be delivered prematurely.

If the cervix is not ripe and induction is performed, the normally short lag period until labor starts is prolonged. A long latent period tends to increase the intra- and postpartum infection.

Conditions, then, should be such as would have been ideal for the onset of spontaneous labor. The more completely such conditions are fulfilled, the smoother and more uneventful will be the induction of labor.

Grier writes that the fetal mortality and maternal morbidity in his series of elective inductions compare very favorably with corresponding figures for general cases; also, that a physician is justified in making labor easier for his patient, provided he can do it safely. He concludes that his results show that "the elective induction of labor in properly selected cases, or in other words, the precipitation of imminent labor, is a justifiable procedure."

Husbands, in Waco, writes, "Elective induction of labor carries no added risk if done at the proper time," and states that there was no appreciable difference in the course of labor in the group in which labor was induced and in the normal control group.

Reycraft believes that labor is definitely shortened and that the results are most gratifying.

Greenhill concludes, "The elective induction of labor, when performed at the proper time, and by one who knows how, carries no risk."

On the other hand, there are many who believe that elective induction is meddlesome and vicious. This group holds that induction should be confined to specific indications.

Dieckmann and McCready write, "The artificial termination of pregnancy by any method is inevitably followed by an increased fetal and maternal mortality and morbidity." The maternal deaths are due to infection, and to hemorrhage and shock. The fetal deaths are due to infection, prolonged labor, injuries, or prolapse of the cord.

Roblee, commenting on Reycrafts' paper, states, "Labor cannot be induced without some degree of combined morbidity except within forty-eight hours of the time spontaneous labor would have started anyway."

In this hospital we do not practice the elective induction of labor except in the occasional case. It is felt that if a sufficiently large number of cases

were collected, the fetal mortality would be found to be higher statistically than in the cases allowed to go into labor spontaneously. Occasionally, however, we do admit for induction a multipara with a previous history of rapid labors, who lives some distance from the hospital. If conditions are ripe for induction, 2 ounces of castor oil is given at 6:00 A.M., and a large hot enema at 8:00 A.M. of the same day. Usually this is sufficient and the patient goes into labor within a short time. If only occasional uterine contractions occur, the membranes are ruptured under sterile conditions. In the group in which there is no uterine response at all to the oil and enema, the membranes are not ruptured and further attempts at induction are postponed. It is felt that further interference might be dangerous and it would be in this group of patients that a prolonged lag period between ruptured membranes and the onset of labor could be expected.

III. Specific Indications for the Induction of Labor

However great the controversy over elective induction, there is no question but that specific indications are frequently met which call for active interference. Unlike those patients chosen for elective induction, this group rarely presents the best possible conditions for induction. The cervix is frequently not ripe. Engagement of the presenting part may not have taken place. There may be evidence of fetal or maternal distress. The membranes may have been ruptured prematurely. Physicians who restrict induction to specific indications constantly stress the potential morbidity and mortality associated with the practice. It may be, that the complication which called for early delivery may have predisposed to a poor result. A prolonged lag between induction and the onset of labor increases the chance of infection. The purpose of the induction itself may be defeated, if this latent period becomes too long. Thus, the obstetrician must evaluate his patient carefully, and, if conditions for induction appear too formidable, a cesarean section is indicated.

Some of the more important complications requiring obstetric interference will be discussed.

1. Placenta Previa.—

Bag induction of the occasional patient is still being done in some areas. Generally, however, the choice is between rupture of the membranes with delivery via the vaginal route or cesarean section. Until quite recently, once the diagnosis of placenta previa or low-lying placenta was made, it was the signal for active interference. It was felt that the maternal danger was sufficiently great to warrant the sacrifice if necessary of the fetus. Lately, however, a more conservative approach has been adopted and an effort made to delay interference until the fetus is at or near term. Patients should be on complete bed rest in the hospital and closely observed. Blood should be readily available. There should be no rectal or other examination. Good physical and mental rest should be assured. By this means, it is hoped to control or prevent the recurrence of bleeding while allowing the infant to mature. If, however, bleeding demands interference, or if the patient is at term, more active therapy can be adopted.

Overstreet and Traut report that the bleeding due to placenta previa can be controlled by a period of bed rest for twenty-four hours in 95 per cent of cases. Johnson states, "Unmanipulated cases of placenta previa will not bleed to death because the blood loss from this condition is intermittent and in each interim the patient has ample time to recover spontaneously from the resultant shock." He advocates that "Fetal salvage can be increased through careful evaluation of the case by blood studies after each bout of bleeding and through carrying the pregnancy to more certain fetal viability."

With the mother at or as near term as possible, it is best then to perform a sterile vaginal examination in such surroundings that cesarean section can be done if bleeding

becomes profuse or if the placenta is felt over the internal os. If the placenta is not central, but merely low-lying, the membranes should be ruptured, and delivery expected from below.

2. Abruptio Placentae.—

In general, it may be said that if the patient is not in labor and the cervix not ripe, cesarean section is indicated. If, however, the cervix is ripe or if labor has already begun, the membranes may be ruptured and the patient delivered from below. Such patients usually deliver quite rapidly. If there is severe bleeding as in complete separation of the placenta, or if there is a Couvelaire uterus, a section should be performed. Naturally, transfusion and antibiotics are necessary.

It is felt by some that rupture of the membranes, with the subsequent improvement in the quality of the labor, will prevent further separation and stop the bleeding.

Cesarean section done entirely in an effort to save the child may be performed at any stage. A warning should be given, however, against subjecting the mother to such a major operation to save a child who, from the quality and rate of the fetal heart tones, is all but dead.

3. Toxemia of Pregnancy.—

The termination of pregnancy is a specific treatment for cases of toxemia which do not respond promptly to medical management. The station of the fetus and the condition of the cervix are of particular importance, and if conditions are favorable simple rupture of the membranes will usually suffice. Such ideal circumstances are found in patients at or near to term. Unfortunately, toxemia is often seen early in the third trimester when the cervix is thick and undilated, and the presenting part high. In such cases cesarean section is the safest procedure for mother and child. This is particularly true of primiparas in whom rupture of the membranes itself can become a major task. Rupture of the membranes at this stage, if it could be done safely, is not likely to be effective at all, and the incidence of prolapse of the cord and infection is increased.

Repeated daily attempts at Pitocin induction via the intravenous route has recently been suggested. It is believed that such a schedule helps ripen the cervix and engage the presenting part. When this occurs, rupture of the membranes usually leads to labor, and some women are saved from cesarean section. If the time is too short for this, cesarean section can be done.

4. Systemic Diseases.—

Diabetes: The prevention of the high fetal waste is of greatest importance here. The treatment of the diabetes is the principal thing but in general it is felt that much good can be done by not allowing the pregnancy to go beyond term. About the thirty-eighth week of gestation the patient is admitted to the hospital and examined. If the cervix is ripe and the head engaged, rupture of the membranes is usually sufficient. If the cervix is not ripe a section should be done. This is frequently modified by the severity and the duration of the diabetes, the patients with the milder, more recent cases being allowed to go into labor spontaneously. The development of pre-eclampsia is considered an indication for emergency delivery.

Patients with cardiac disease should be hospitalized well in advance and got into the best possible condition for induction. When conditions are favorable the membranes should be ruptured and the patients delivered from below. Patients with cardiac disease are notoriously poor cesarean section risks. In general the same is true for patients with *pulmonary tuberculosis.*

5. Cephalopelvic Disproportion.—

This was once a favorite indication for the induction of labor. Today, however, the practice has been discarded in favor of a trial labor. If this should fail, a cesarean section is performed. The fetal mortality rate for the premature induction of labor for disproportion is 17 to 21 per cent.

6. Postmaturity.—

Greenhill states that postmaturity is a very rare condition. Certainly, induction is rarely performed for this reason today. The degree of ripeness of the cervix is the best guide to maturity. If the cervix is long, not dilated, and firm, the patient is not at term,

regardless of the fact that she may be beyond the estimated date of confinement by several weeks. If there is any clinical question of postmaturity, the patient is better served by awaiting spontaneous delivery rather than by risking infection by rupture of the membranes. In other words, she should be treated as a case of questionable disproportion and section performed if a trial labor should fail.

7. Ruptured membranes.—

The status of the cervix is again the important point here. If this is ripe the patient will probably go into labor soon or with the prompting of an enema and perhaps castor oil. If the cervix is not ripe, oil and enema will be useless. Moreover, the incidence of rupture of the uterus is increased when pituitary extract is given twenty-four hours or more following rupture of the membranes. Such patients with prolonged rupture of the membranes should be given antibiotics and not meddled with, as they will usually go into spontaneous labor and deliver uneventfully in one to fourteen days.

Summary

1. Some of the common methods of inducing labor have been discussed.

Rupture of the membranes is the most important single procedure for induction.

A trend toward the more liberal use of pituitary extract is noted. The lack of standardization of the drug, the use of too large doses, and the lack of knowledge of indications and contraindications were undoubtedly responsible for most of the early accidents.

2. Elective induction of labor is a source of controversy.

Some of the conflicting opinions have been presented.

The ripeness of the cervix is the most important factor in the selection of cases.

Rigid selection of patients for induction is absolutely necessary.

3. Specific indications are frequently met which call for active interference.

The more common of these have been discussed briefly.

Conditions for induction are rarely ideal in this group.

Induction of labor is no longer the treatment of choice in cephalopelvic disproportion and postmaturity.

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TRENDS IN THERAPEUTIC ABORTION*

R. VERNON COLPITTS, M.D., HOUSTON, TEXAS

IN ANCIENT times therapeutic abortion was done to save the life of the mother, and one Greek school of philosophy gave serious consideration to certain eugenic aspects of the procedure. In the early Christian era, toward the end of the fourth century, a leading physician, Priscianus, recommended abortion to save the life of the mother. As the influence of the Roman Catholic church became more widespread, physicians were threatened with "eternal punishment" for taking the life of the unborn child and after the tenth century medical treatises contain no mention of this subject, nor was the question reopened until the beginning of the eighteenth century. Even then no note was taken of these occasional papers until William Cooper in 1772, speaking of the bad results of cesarean section in cases of contracted pelvis, stated: "In such cases where it is certainly known that a mature child cannot possibly be delivered in the ordinary way alive, would it not be consistent with reason and conscience, for the preservation of the Mother, as soon as it conveniently can be done, by artificial modus to attempt to produce an abortion?"

Dewees in 1843 quotes with approval Alfred Velpeau, who had said: "For my own part, I confess I cannot possibly balance the life of a foetus of three, four, five or six months, a being which so far scarcely differs from a plant, and is bound by no ties to the external world, against that of an adult woman whom a thousand social ties engage us to save; so that in a case of extreme contraction, if it were mathematically demonstrated that delivery at full term would be impossible, I would not hesitate to recommend abortion in the first months of gestation."

In England and France many obstetricians accepted these suggestions, but in Germany it was not until the beginning of the nineteenth century that Kiwisch, Scanzoni, and others advocated therapeutic abortion. During the latter half of the nineteenth century and especially in Germany, the indications were extended to include tuberculosis, heart disease, nephritis, and certain forms of psychoses. In the present century, particularly since World War I, there has been an increasing tendency to extend the indications to eugenic and socio-economic factors.[1]

Hasseltine, Adair, and Boynton define therapeutic abortion as follows: "Therapeutic abortion means the termination of an apparently normal intrauterine pregnancy before the period of viability in an effort to save or prolong the life of the mother."[2]

It is obvious that the undertaking of a therapeutic abortion throws considerable responsibility upon the patient and her physician. To date the legal

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bodies and physicians have had considerable difficulty in defining indications.[3] In the state of California no one may ". . . procure the miscarriage of such woman, unless the same is necessary to preserve her life." Most states make no mention of permitting abortion simply to preserve the health of the mother. There are no legal provisions for the removal of an imperfect fetus.[4]

Among the fundamentals of medical ethics is the firm belief that the physician must expend every effort to preserve and prolong life, avoiding all procedures which can be considered harmful to the individual. Through the centuries, however, the physician has always found himself faced with a dilemma—the problem of the pregnant woman afflicted with a complication which seriously increases the risk of maternity. In dealing with such a problem he must follow one of two courses. Choosing the first, he can destroy embryonic or fetal life in the interest of maternal health and, often, in the interest of the family group. As an alternative he can regard the embryo or the fetus as of prime importance and disregard the increased risks to the mother and her importance to the family. There can be little doubt that the majority of physicians lean toward the former viewpoint.[5]

It is interesting to note the changes in indications for therapeutic abortion over the years. The advances in medical management and chemotherapy and newer concepts of disease processes have tended to reduce the number of indications, some to the vanishing point[7]; while on the other hand the same factors in recent years have created new indications. The one outstanding feature is the increasing awareness among obstetricians and their referring specialists that the need for the therapeutic termination of a normal intrauterine pregnancy is becoming better defined.[6]

We shall attempt to trace the trends in therapeutic abortion. We have taken seven major groups for discussion and with only one exception the number of therapeutic abortions for these indications has been on the decline. The groups are: (1) toxemia, (2) cardiac disease, (3) pulmonary disease, (4) urologic disease, (5) neurologic and psychiatric disease, (6) medical diseases, and (7) miscellaneous.

Incidence

The incidence of therapeutic abortion in several clinics and the indications in some of them are listed in Table I.

Indications

Toxemia.—

Reports from every one of these clinics save one reveal that toxemia constitutes the largest single indication for therapeutic abortion. This includes both renal and hypertensive diseases. Renal disease is the type of toxemia most frequently encountered. Patients usually give evidence of their disease by persistent albuminuria and impairment of renal function.[10] Renal function is evaluated by: (1) the presence or absence of albuminuria, (2) concentration test, (3) phenolsulfonphthalein test, (4) intravenous pyelogram, (5) urea clearance, and (6) retrograde pyelography and cystoscopy.[6]

In cases of acute nephritis, some authorities feel that therapeutic abortion is advisable to avoid the possibility of kidney damage. Any decision regarding

TABLE I*

HOSPITAL	NO. THERAP. ABORTIONS	RATIO TO DELIVERIES	INDICATION IN %						YEARS REPORTED
			TOX-EMIA	TUBERCU-LOSIS	CARDIAC DISEASE	NEURO. AND PSYCH. DISEASE	UROLOGIC DISEASE	OTHER	
Chicago Lying-in	134	1:195	28	24	20	15	2	11	1931-1939
New York Hospital	280	1:167	35	11	24	6	10	14	1932-1943
Margaret Hague	4	1:16, 750	100	0	0	0	0	0	1931-1943
Bellevue	199	1:76	8	47	16	13	2	14	1935-1945
State University of Iowa	137	1:169	36	23	13	13	8	7	
Woman's Hospital, New York		1:8							1941
Sloane Hospital, New York		1:145							
Johns Hopkins		1:65							1936-1947
University of California		1:37							1938-1942
		1:107							1943-1947
		1:63							1938-1947

*Table I is obtained from References 4, 8, and 9.

the advisability of future pregnancies would depend upon the degree of permanent damage to the urological system. Therapeutic abortions have been done upon patients in whom another pregnancy followed closely a pregnancy complicated by severe pre-eclampsia, even though no signs of toxemia were yet present.[10]

If albuminuria is present and increasing and if any degree of edema is present, one is justified in emptying the uterus. A history of nephrosis of simple type need not contraindicate further pregnancies nor need subsequent pregnancies be interrupted because of the history of previous nephrosis, provided the sign of the disturbance vanished shortly after delivery and the patient showed no evidence of the disease in the interim between pregnancies.[11]

In the case of nephritis confined to inflammatory processes in the kidney and their sequelae, the condition may be focal, embolic, or diffuse; acute or chronic; with or without edema. Albuminuria is present, hematuria is obligatory. Hypertension is almost always present and occurs early. Anemia of the secondary type is characteristic. Placental infarction and separation, fetal death, and spontaneous delivery often of a macerated fetus may be expected in 60 per cent of cases. To this is added a decline in the efficiency of the maternal kidney as a result of prolonging the pregnancy. Together they present a strong argument for abortion in cases of proved nephritis.

In summary, if nephritis is present at the time of conception, abortion should be done promptly. If the disorder is latent and arises early in pregnancy, and if marked by a considerable albuminuria which tends to increase despite treatment, it is unlikely that the pregnancy will succeed. In the interest of maternal welfare it should be terminated. If to albuminuria are added edema and hypertension, then abortion becomes obligatory. If nephritis occurs in the second half of pregnancy the problem arises of carrying the pregnancy to viability.[11]

Hyperemesis gravidarum used to be a common form of toxemia for which therapeutic abortion was done. Today, with a clearer concept of the disease, and the advent of intravenous and supplementary therapy, it is no longer a valid indication. No abortions for this cause have been reported since 1938.

The problem of hypertension coexisting with pregnancy calls for consideration of three important prognostic factors: (1) threats of superimposed pre-eclampsia and abruptio placentae which are relatively common in hypertensive disease; (2) the possibility that long-continued hypertension may become permanent or level off at a higher figure than existed before pregnancy, thus decreasing the longevity of the mother; (3) poor fetal salvage in this group.[8]

I should like to mention the conclusions reached by Dieckmann[21] in an excellent study published in the October, 1952, issue of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY: If all patients with toxemia of pregnancy are treated as a single group, the increasing age of the patient, the increasing interval between pregnancies, as well as increasing parity, are all associated with an increasing rate of recurrence of toxemia in the next pregnancy. The onset of hypertension, proteinuria, or edema in early pregnancy or the duration of one or more of these signs for longer than five weeks is almost always associated with a diagnosis of hypertension which carries a higher recurrence rate. The time of onset or the duration of hypertension or proteinuria has no effect on the recurrence rate in the pre-eclamptic group. It is unwise for the patient who has had toxemia of pregnancy to wait two, three, or more years for the vascular-renal system to return to normal. A woman under 25 years of age, especially if she is a primipara, is less likely to have hypertensive disease than one over 25. If she has had pre-eclampsia, the shorter the interval to the next pregnancy, the less likelihood there is for the development of essential hypertension.

Toxemia is decreasing as an indication for abortion, probably as a result of our improved methods of studying and evaluating patients from pregnancy to pregnancy. Our increase in knowledge and management makes it possible for us to contemplate with greater equanimity the added burden which pregnancy imposes upon such patients.[4]

Cardiac Indications.—

In cardiac conditions the greatest unanimity of opinion has been evolved. It is mentioned as an indication for therapeutic abortion in a book by Gaillard Thomas[12] published in 1891.

Anatomic diagnosis was once considered important and prognosis was thought to depend upon the character of the pathologic changes.[13] From 1912 to 1919 the functional ability of the heart came to be better understood. It was realized this was not definitely dependent upon the character of the pathologic changes and if a measure of functional ability could be devised this would afford a better guide to the expected behavior of the heart during pregnancy. It was Sir James McKenzie who pointed out in 1921 certain errors resulting from attempts to rely solely upon the pathologic diagnosis.

Pardee[13] in 1934 mentioned 3 complications that affected prognosis: (1) auricular fibrillation (patients with auricular fibrillation and Class 3 cardiac disease should not go through labor); (2) certain congenital malformations; (3) bacterial endocarditis.

Dr. Burton Hamilton states, "Unless a heart presents definite enlargement, a diastolic murmur, a loud systolic murmur usually with a thrill, or a dangerous disorder of the heartbeat, it will not fail in labor."

By the New York Heart Association classification, patients in Classes 1 and 2 can usually be carried to term with no difficulty. Patients placed in Class 3 represent a definite hazard and those in Class 4 are faced with almost certain disaster.[5] Patients with auricular fibrillation and with certain congenital malformations are considered to run a greater risk than others in the same functional class.[9]

Congestive heart failure which tends to progress in spite of treatment and is characterized by an increase in systemic or pulmonary venous pressure, or both, constitutes a clear-cut indication for therapeutic abortion regardless of whether the failure antedated the pregnancy. In patients with previous failure pregnancy should be allowed to proceed only if extraordinary precautions are taken and the patient is kept under close observation.[14]

Some of the disturbances in the mechanism of the heartbeat are so serious that they call for therapeutic abortion. Included among these are: auriculoventricular heartblock and bundle branch block, chronic and paroxysmal auricular fibrillation, auricular flutter, and ectopic tachycardia, especially ventricular tachycardia.[14]

Mitral valve disease frequently puts patients in Class 3 or Class 4. Recently surgery has been able to do much for these patients.

Therapeutic abortion for cardiac disease is declining. Some clinics already have reduced this to the vanishing point. The group at the Margaret Hague Maternity Hospital has not considered this a valid indication for years. The University of Maryland group in 1941 reported no abortions for cardiac disease during 6,200 deliveries.[4]

Pulmonary Diseases.—

The commonest pulmonary indication is tuberculosis. A most vehement controversy centers over tuberculosis as an indication for therapeutic abortion. There is no statement that can be made about this complication but that a completely contradictory opinion can be quoted from an equally competent source.[9]

Tuberculosis has been considered a valid indication for therapeutic abortion for years. It is interesting to note a remark of Gaillard Thomas in 1889 in

regard to tuberculosis: "If a patient has third stage phthisis you should not induce abortion, because it is impossible that the woman should live under any circumstances."[12] In the early twentieth century the coexistence of tuberculosis and pregnancy was considered so disastrous that a pregnant tuberculous woman was almost invariably advised to have a therapeutic abortion.[15]

Taussig[1] in his book on abortions in 1936 summarized tuberculosis as follows: (1) Pregnancy has an unfavorable effect on tuberculosis. (2) Latent tuberculosis does not justify interruption. (3) Active or progressive tuberculosis is an indication for interference. (4) Therapeutic abortion in two-thirds or more of these cases will diminish the harmful effects of the pregnancy on the tuberculous lesion.

It seems well established that aside from the disturbed nutrition and temporary lowering of resistance, which are caused by the nausea and vomiting of early pregnancy, the course of the tuberculous process is not infrequently favorably influenced during the later months and again unfavorably influenced after birth of the child. The changes of intrathoracic mechanics during pregnancy seem to be one of the most powerful forces which would be inclined to influence pulmonary tuberculosis.[15]

Interruption is advised if the lesion is active and recognized before the third month. In no case should a mother with an active lesion nurse her child.

One should advise avoidance of pregnancy till two years after the lesion is healed. Repeated pregnancies are inadvisable. Therapeutic abortion is indicated only during the first trimester.

The danger periods are recognized as: (1) the first trimester, (2) the period of labor and the immediate puerperium, (3) the period of lactation.[5, 15]

Overstreet and Traut[4] in 1951 said: "Tuberculosis is no longer held as a real good reason for abortion—most obstetricians and phthisiologists adhere today to the view expressed by Eastman that if extra work incident to pregnancy can be avoided—and her socio-economic conditions play a paramount role—pregnancy per se has no effect on tuberculosis."

Moore[8] in his review in 1952 said: "It has been the general policy in our clinic to interrupt pregnancy only in those patients who have active exudative pulmonary tuberculosis and are within the first three months of gestation. . . . This policy is based upon the feeling that patients with active exudative tuberculosis are unable, because of the demands and restrictions of pregnancy, to follow minutely the regimen of tuberculosis therapy. During recent years the trend has been toward the concept that pregnancy, in itself, does not affect the course of tuberculosis adversely, nor does it prevent medical or surgical measures aimed at arresting the disease."

Probably the most comprehensive recent work has been that of Schaefer,[18] who compared in a recent article 63 patients who had therapeutic abortion for tuberculosis with 407 who had full-term deliveries. Results showed that mortality after therapeutic abortion is higher than after full-term delivery and mortality in the nonpregnant group was not lower than in those pregnant women who delivered full-term infants. After abortion 12, or 19 per cent, died; 57 per cent showed no change; and 24 per cent were improved. After full-term delivery, 76, or 18 per cent, died or their disease progressed; of 407 women delivered, 43 per cent remained unchanged, 39 per cent improved. Schaefer therefore concluded that: (1) Therapeutic abortion per se does not stop progression of far-advanced tuberculosis. (2) End results after full-term delivery are no worse than those after therapeutic abortion in tuberculous patients. (3) Prognosis in pulmonary tuberculosis complicating pregnancy is influenced by the type and extent of the disease and by the introduction of early and adequate treatment.

Schaefer[20] also feels that the coexistence of pregnancy and pulmonary tuberculosis in no way limits the type of therapy to be used in the treatment of the disease. Bed rest is still the basis for all therapy.

The great majority of phthisiologists are now agreed that pneumothorax should be instituted when indicated during pregnancy just as in the treatment of tuberculosis without pregnancy.

For those patients in whom simple measures of collapse therapy have previously been tried and proved unsuccessful, the next logical step is the performance of thoracoplasty. Pneumoperitoneum can be used if it is felt wise.

The trend in the treatment of pulmonary tuberculosis is to remove the diseased lung tissue rather than collapse the lung and await a healing of the cavernous or necrotic lesion. Removal is accomplished by either lobectomy, segmental resection, or pneumonectomy. These can all be done during pregnancy.

It is now felt that streptomycin can be used safely during any stage of gestation if it is considered beneficial to the tuberculous patient.

Urologic Diseases.—

In urologic disorders the trend is again that fewer indications are now considered valid and fewer and fewer therapeutic abortions are being done.

Pyoureteritis used to be a valid indication. Cases which were often intractable are now being well handled with one or a combination of the newer antibiotics and this disease is now scarcely ever an indication.[10]

Renal tuberculosis of any degree of activity whatsoever still calls for therapeutic abortion. If one kidney has been removed for tuberculosis then pregnancy is contraindicated. The possible exception is in cases where there has been a lapse of five years without evidence of involvement of the remaining kidney.

The question of genitourinary malignancy is now being questioned as an indication for therapeutic abortion. Many feel the malignancy should be treated and the pregnancy ignored.

If congenital polycystic kidney disease is bilateral, this usually contraindicates the added strain. Patients carefully followed free of infection and showing good function according to the usual standards, may withstand pregnancy well.

Chronic nephritis offers a poor prognosis for the successful outcome of pregnancy. This has been mentioned earlier in regard to superimposed toxemia.

The problem of the patient with one kidney is based on functional capacity and the cause of the previous nephrectomy. It is conceded that a time interval of twelve to eighteen months is required for compensatory hypertrophy to occur. It is generally felt that a minimum of two years should intervene before pregnancy is attempted. A patient with only the left kidney is considered a better risk than one with the right kidney remaining.[6]

Dippel[22] cites several cases of successful outcome of pregnancy after nephrectomy in an article in the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, April, 1951, and discusses the usual function tests.

Moore[8] in his report says: "All patients with demonstrable impairment of renal function and a significant decrease in the renal reserve require full investigation. If early in pregnancy a kidney shows inability to clear blood of nitrogenous wastes and if, after nephrectomy, the remaining kidney is in danger of becoming infected or of having a pre-existing infection aggravated by pregnancy much weight is lent to the indication for abortion."

Neurologic and Psychiatric Indications.—

This is one field where indications for therapeutic abortion are becoming more liberal. Permin and Thomsen[16] in 1948 published a report in *Acta medica Scandinavica* which showed an increase from 22 cases in 1943 to 117 in 1947.

In 1943 Cheney[17] during a panel discussion said: "A review of the literature and my personal experience do not lead me to believe that there is any specific neurologic or psychiatric disorder which is in itself and without exception an absolute indication for the interruption of pregnancy." This same thesis was presented by Arbuse and Schechtman[3] in 1950. In the past two decades the number of cases in which an abortion must be done has taken a definite drop, while the number of cases in which it may be done has at the same time increased.

In setting the indication one must be guided by the disease, the individual, her age, number of children, economic status as it affects her diet, her household, and parental obligations, her ability to carry out institutional treatment, and the hereditary and constitutional factors in the particular case.

Pregnancy predisposes a woman to no particular type of psychosis; also, it is not possible to say that it hastens it or makes a pre-existing psychosis more severe. Patients who might be harmed by pregnancy, however, are those suffering from severe reactive depressions in whom the added burden of pregnancy at that time might lead to a serious psychiatric difficulty.[8] Women who have suffered several times with postpartum psychosis should probably have abortions to prevent repeated episodes.[17]

The commonest neurologic indications appear to be epilepsy and multiple sclerosis, both of which are quite controversial issues. In fact, some authors now feel that multiple sclerosis can no longer be regarded as a valid indication for therapeutic abortion.[29] Tabes, chorea, polyneuritis, myasthenia gravis, bulbar paralysis, amyotrophic lateral sclerosis, progressive spinal muscular atrophy have all been listed as indications.

Medical Indications.—

Therapeutic abortion is occasionally done for hyperthyroid disease. Present methods of management, however, have just about eliminated this as an indication because pregnancy does not contraindicate any specific medical or surgical measure of therapy.

Hodgkins' disease has also ceased to be an indication.

Ulcerative colitis, Raynaud's disease, sarcoidosis, chronic arthritis, diabetes, have all been reasons for therapeutic abortion. At present it is doubtful if any of these, even with a pregnancy superimposed, is a real threat to the life or health of the mother.[7]

Miscellaneous.—

Under this we have included those indications for which therapeutic abortions have been increasing:

Rubella: This frequently causes congenital cataracts and is associated with some or all of the following defects: (1) microcephalus, (2) deaf mutism, (3) congenital deformities of the heart, (4) dental defects. To these have been given the name "rubella syndrome." In 199 cases, only 32 (16 per cent) children were born without defects; 100 per cent were defective when the disease occurred in the first month of pregnancy. In older women, however, in whom further pregnancies are unlikely, it may be better to gamble on the embryo's being unaffected. Termination of pregnancy because of the occurrence of other virus diseases in the pregnant woman does not appear to be justified by the present clinical evidence.[5, 9]

Rh negativity: Abortion is indicated in women already immunized from preceding pregnancies which had resulted in one or more erythroblastotic infants with fatal forms of the disease, whose husbands' blood groups were such as to exclude the possibility of an Rh-negative infant.[5, 9]

Method of Interruption

The method of interruption in general has depended upon the duration of the gestation and the reason for which the pregnancy was being interrupted. If the decision was reached during the first trimester, dilatation and curettage was the procedure of choice, unless, of course, a tubal ligation was contemplated at the same time in which case a hysterotomy and ligation were performed through the abdominal route. When interruption was considered in pregnant women after the first trimester, abdominal hysterotomy was the procedure of choice. Abdominal hysterectomy was done in a smaller number of cases.[4, 7, 8, 10, 19]

Rupture of the membranes and insertion of a Voorhees bag was employed in some patients approaching six months. This method has been largely abandoned at present.[8]

Gaillard Thomas[12] in 1889 advocated the use of a small divulsor to dilate the cervix to the diameter of a finger. Then he placed a cone in the cervix, packed the uterus tightly with Iodoform gauze, and left it in place twenty-four to thirty-six hours. In most clinics this method has been replaced.

Comment

Therapeutic abortion is designed primarily to preserve the life of the mother. It is sometimes difficult to state with reasonable certainty that allowing pregnancy to run its natural course will result in the death of the mother. Severe and advanced degrees of cardiovascular-renal disease can be judged fairly accurately to jeopardize the mother's life.

Statistically, severe cardiac disease represents a real threat to the mother in selected cases; in certain clinics this disease has come to occupy the top position as a cause of maternal mortality. Under these circumstances it is logical that an occasional cardiac patient needs therapeutic abortion. Our most recent means of decreasing the indications for and the number of therapeutic abortions rests with the cardiac surgeons. Recent surgery for mitral stenosis, coarctation of the aorta, and certain congenital anomalies has given favorable results. A wide field exists here for the improvement in our fetal salvage.

It is debatable whether we should consider as candidates for therapeutic abortion those patients in whom the combination of pregnancy and the indicated disease has a good chance of decreasing maternal longevity. It is not easy to disregard the mother's right to object to the continuation of a pregnancy which might increase her chances of an earlier death. Certainly the shortening of the expected life span and the value of the child to the family and society become factors which must be weighed against each other.

There are conditions which, in the past, might have justly claimed consideration for therapeutic abortion, but which at the present time would warrant little attention: contracted pelvis, pernicious vomiting, and avitaminosis. Recent surveys have shown that women with pulmonary tuberculosis do just as well when pregnancy is allowed to continue as when it is therapeutically interrupted, and that the mother has an even better chance of survival than her nonpregnant control.

In most psychoses, therapy may be employed during the course of pregnancy without adversely affecting the mother or the baby. The same may be

said of the reactive depressions, many of which present suicidal tendencies, in which the pregnancy itself acts as a definite mental irritant.

Some indications seemingly justified at the time do not stand the test of future analysis: malignancy (osteogenic sarcoma, Hodgkins' disease, and rectal carcinoma), myomas of the uterus with pain, and some of the neurologic diseases (paralysis agitans, epilepsy, multiple sclerosis, and Huntington's chorea). Pregnancy associated with these diseases is probably not sufficiently detrimental to the health of the mother for them to qualify.

But whatever indications we may use, therapeutic abortion always constitutes a failure of medical science.[1]

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THE USE OF INTRAVENOUS AND INTRAMUSCULAR INJECTIONS OF DEMEROL AND SCOPOLAMINE IN LABOR AND DELIVERY*

G. G. Passmore, M.D., and Edgar W. Santa Cruz, M.D., San Antonio, Texas

(From the Nix Memorial Hospital)

THE purpose of this paper is to relate our experiences with intravenous and intramuscular Demerol and scopolamine in combination with one of the barbiturates orally for sedation, analgesia, amnesia, and anesthesia in labor and delivery of 917 of our private patients in the years 1952 and 1953 at the Nix Memorial Hospital, San Antonio, Texas.

This has not been an experiment with a preconceived idea to be proved; but a development, on the basis of previous knowledge, and experiments of others, of a method of handling labor and delivery which we have found satisfactory to pass on to our colleagues.

Here is a little background on how we began using intravenous Demerol and scopolamine. In 1947, one of us (E. W. S.), seeking a rapid, pleasant method of analgesia and control of patients who were admitted in advanced labor, many times hysterical, and often ready for delivery, set out to determine if Demerol and scopolamine could be given safely together intravenously in the same syringe as a routine procedure. This proved to be a safe procedure and obviously a quite useful one. The only unpleasant reaction noted was occasional nausea and/or vomiting. This proved to be a blessing in disguise, however, because most of these patients who vomited had stomachs full of food or fluid and this was an excellent way to empty the stomach, obviating the use of an emetic. While the Demerol and scopolamine are being given slowly intravenously, patients should be forewarned that they will soon feel dizzy, sleepy, and a little numb all over and maybe a little nauseated. Warning them of these things prevents fright when the drugs are taking effect and hence the patients are more cooperative.

The next step was to determine the safety of repeating Demerol and scopolamine intravenously as often as desired during labor. This also proved to be satisfactory and advantageous. The intravenous use of Demerol and scopolamine has now become quite popular with most of the obstetricians in this region and we note by the current medical literature that Demerol and scopolamine are being used more and more intravenously all over the country, not only in obstetrics but in other fields of medicine and surgery as well.

Later, one of us (G. G. P.) demonstrated successfully that delivery with repair of episiotomy could be accomplished routinely with no discomfort or awareness to the patient by using adequate dosages of Demerol and scopolamine either intravenously or intramuscularly with oxygen by mask at the time

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of delivery. Besides augmenting the supply of oxygen to the baby, oxygen administered to the mother at this time appears to act synergistically with the Demerol and scopolamine, producing better anesthesia. Again, during the repair of the birth canal, the Demerol and/or scopolamine may be repeated if necessary.

Just as a matter of speculation as to why anesthesia is accomplished satisfactorily in this way, possibly because of the similarity of the Demerol formula to that of the local anesthetics, it appears to act in a similar manner, being carried to all the tissues by the blood stream, perhaps hastened by the oxygen. Also, of course, the action of the scopolamine produces amnesia and sedation.

Material

These 917 deliveries are the private cases handled by us in 1952 and 1953, with each labor and delivery conducted by us, and the records personally analyzed. A few cases in 1949, almost all cases in 1950, and all in 1951 were also delivered in this manner; the total number is at least 1,675 deliveries with 917 carefully studied. These patients, some at great economic sacrifice, with work and food conditions far from ideal but most with average incomes, knew they wanted their labor and deliveries to be as pleasant and comfortable as possible with the ideal outcome, "a healthy baby and mother." Many are referred and unfortunately more sought specialist care themselves because of previous obstetrical tragedies. We therefore expect more than average complications.

Method

On admission the labor patient is given 3 grains of an oral barbiturate. Demerol, 100 mg., with scopolamine, 1/150 grain, is then given slowly intravenously or intramuscularly depending upon the choice of the individual obstetrician. The Demerol, with or without scopolamine, is repeated as often as necessary throughout labor. This is usually at one- or two-hour intervals. Following delivery, the patient is usually completely unsedated in one to three hours after the last medication although difficulty in focusing the eyes may persist a few more hours. If the patient becomes suddenly restless and uncomfortable, intravenous Demerol and scopolamine are given irrespective of the time interval since the last dose or proximity to delivery. Three doses of scopolamine usually give amnesia and its effect is more persistent than that of Demerol, so in the repeat doses the scopolamine may be omitted or given in half doses.

A multipara with "a rim of cervix remaining," or a primigravida almost ready for delivery is taken to the delivery room where oxygen is administered by mask, ideally, for twenty minutes before delivery and during vaginal repair. The Demerol and scopolamine are repeated in half or full doses, usually intravenously, as needed to keep the patient manageable. Frequently none, and rarely more than one dose, is given in the delivery room.

The best guide to the safe administration of Demerol is close observation of the patient's respiration which should not drop below 12 per minute. If this should happen, it is easily returned to a better level by Coramine, Metrazol, or Nalline, and oxygen by mask. In this series, the stimulants have rarely been used before delivery, occasionally afterward. Scopolamine gives flushing, tachycardia, and dilated pupils. A pulse rate of 120 is not alarming.

Patients in whom labor is to be induced are well sedated before the induction is begun. The patients are carefully watched by an experienced "floor" or

"special" nurse who rarely has more than four active cases at a time. One or two members of the family usually stay with the patient during labor, although this is not necessary.

Results

With the previously described routine, we keep the patient sleeping throughout labor. About the only obvious signs of labor noted are deep respirations, in the first stage, and "bearing down" involuntarily in the second stage. After delivery the patient lies quietly during episiotomy repair. Labor and delivery are automatic, and the less interference we have from pain which causes voluntary muscle spasm, adrenal gland hyperactivity, exhaustion and shock, the more nearly "normal" the process will be. All of you have had enough experience to know that this will not be accomplished smoothly in every case since people and labors are erratic, but we are approaching it more closely and frequently than we had thought possible without the long-awaited "perfect obstetrical analgesic." We use low forceps and episiotomy routinely when possible, but with the patient bearing down from perineal pressure many multiparas and some primiparas deliver spontaneously with only episiotomy as the head distends the perineum. Also we both rotate posterior presentations rather than waiting them out, but most of these are now watched in spontaneous rotation as the perineum is manually stretched.

These well-sedated labors are on the average far shorter in both first and second stages than the times given in textbooks; however, it is in the occasional prolonged labor that the value of resting a patient throughout labor, instead of only after exhaustion, is most evident. Intravenous fluids and antibiotics are used as indicated and after thirty or forty-eight hours of sedated labor, she awakes in a normal postpartum condition, not physically or emotionally shocked and needing months for partial recovery.

Sedation and anoxia are confused in many people's minds. Sedation and anesthesia are useful, beneficial results of certain drugs. Anoxia produces the damaging effects of lack of oxygen to all tissues. Fetal anoxia may be produced by:

1. Maternal anoxia from occlusion of the air passages as from vomited food or mucus with cough reflex blocked by inhalation anesthesia, or shock levels of blood pressure such as can follow even a small-dose spinal or caudal injection.
2. Maternal hypotension from any cause, since blood will not be delivered to the placenta.
3. Separation of the placenta in abruptio and previa.
4. Compression of the cord in prolapse, occult prolapse, or short cord tight around the baby's neck or extremity.
5. Compression of the cord or placenta in utero, due to violent contractions.

Neonatal anoxia is produced by:

1. Blocking of the baby's air passages with mucus or amniotic fluid which is not adequately removed before it is aspirated, or with regurgitated stom-

ach contents while the baby is lying on his back unattended in the first few hours or days of life, or with blood from traumatized nose, throat, or skull.

2. Cerebral edema, or hemorrhage from long difficult labor, traumatic delivery, allowing the baby's head to pound on a rigid perineum, or failure to do episiotomy.

3. Depression of the baby's respiratory center by anoxia (pre- or postnatal), or by drugs.

Certainly, we are not so dogmatic as to present our technique of conducting labor and delivery as some sort of panacea and we are quite aware of the fact that many of you, as well as many pediatricians and anesthesiologists, are going to question its safety and effectiveness. We have our statistics for support, however. We can say without reservation that our experiences with it have been truly gratifying for us as well as for our patients. In the light of our statistics and the number of cases which we have handled, we feel that the previously described technique of conducting labor and delivery, properly and judiciously used with close observation of the patient by a doctor and a competent nurse, offers little or no hazard to either mother or baby, and certainly not as much as some other methods used today. On the contrary, unnecessary obstetrical trauma, exhaustion and shock, and permanent psychic damage are avoided.

Almost without exception, expectant mothers desire and deserve absolute unawareness of and freedom from the anxieties and excruciating pain of labor and delivery. We emphasize that, with few exceptions, this desire can be granted witih the judicious use of the drugs we have available today. Yet every day we see obstetrical patients who are frightened into resorting to such monstrosities as the so-called "natural childbirth," and other methods just as ridiculous in these modern times, all because sensational writers for the lay press, well-wishing relatives and friends, and even some physicians, who have little or no experience with good analgesia and sedation, force feed these unfortunate women with misinformation and nonsensical ideas concerning the use of drugs in labor and delivery.

They are told that drugs will keep the baby from breathing or, if he does survive, he will have a low I.Q. They are told that the baby will have to spend the first four or five days of life in an incubator because of drugs. They are led to believe that they must endure pain because drugs stop labor or that they must be conscious in order to work with their pains and assist the doctor in the delivery of their babies. They are even hypnotized into believing it is so wonderful, so satisfying, and so soothing to be awake in the delivery room, to hear that first little cry, which is more of a figment of masochistic imagination than a reality. Most of the time it is downright disappointing to both patient and doctor for the patient to be conscious of what is going on in the delivery room. In our opinion, it is never wise because of potential complications which may involve either mother or baby or both, and, when these complications do arise, both patient and doctor are placed in awkward or dangerous circumstances. There are many couples who have only one child because of the discomfort and unhappy experiences they remember in having their first baby and more broken marriages from the resulting fear of preg-

nancy. We feel that it is far more gratifying for a mother to wake up from a peaceful sleep and see her baby for the first time without having experienced the anxieties and pain of labor and a possible unpleasant delivery room ordeal.

During labor we have the advantages of increased safety, since the hazards of inhalation and spinal anesthesia are avoided, complete comfort, and maximum freedom from anxiety. After delivery, the patient can drink water as soon as she asks for it without nausea and sit up to void without a spinal headache. Postpartum catheterization is extremely rare.

One additional point needs mentioning. The labor does not stop with the head on the perineum from ether blocking the contractions or lack of the perineal reflex in regional block, so the obstetrician must be in close attendance. We feel that the increased danger of abruptio or cord compression at this time makes prompt delivery important. Patients under Demerol will deliver spontaneously without excessive delay.

We know you are curious as to what happens to the babies we deliver in so far as respiration is concerned. Our answer to this is that we do not have any more trouble than our colleagues who use other methods and our statistics are just as good as theirs are. As a matter of fact, we have many more spontaneous respirations now than when we used terminal inhalation anesthesia with less Demerol and scopolamine. There are many causes for asphyxia in newborn infants other than drugs which are probably the least offenders. Every time something happens to a baby, however, somebody immediately blames drugs.

While on the subject of asphyxia neonatorum or depressed respiration from any cause, we would like to stress the importance of the mastery of the art of skillful resuscitation of newborn babies by every doctor who does obstetrics. This is a lifesaving measure and many times prevents atelectasis, brain damage from anoxia, and other complications associated with depressed respiration. Too few doctors who are doing obstetrics know how to resuscitate newborn babies properly.

By far the most effective and most satisfactory method of resuscitating newborn babies when necessary is proper and skillful application of the intratracheal catheter as originated by De Lee, and as has been preached, practiced, and taught for many years by Dr. B. H. Passmore of San Antonio, and as described in several good textbooks. We wholeheartedly agree with Dr. Edith Potter that inhuman and obsolete methods such as beating the baby black and blue, swinging it in the air, dousing it in basins of hot and cold water, and mouth-to-mouth breathing should be banned from the delivery room. The air passages (nose, pharynx, and trachea) of these depressed babies require prompt, thorough clearance of mucus, amniotic fluid, and debris and then passive inflation of the lungs with oxygen or a mixture of oxygen and carbon dioxide to insure immediate oxygenation of the tissues of these babies. This passive respiration, simulating normal respiration as nearly as possible, should be continued until the infant breathes by himself. When properly done, there is no better or safer way of accomplishing this than by

proper application of the intratracheal catheter which is inserted gently into the trachea with the index finger as a guide. After the nose and pharynx are cleared of mucus, amniotic fluid, and debris, and breathing is established, the trap may be removed from the catheter and oxygen may be given intermittently into the trachea through the catheter which has been left in place. We make a practice of using the intratracheal catheter routinely on any baby that appears at all sluggish, not waiting for cyanosis. Any limp, pallid baby has a sterile catheter in place within forty seconds. Any competent nurse can be taught how to use the intratracheal catheter skillfully.

While on the subject of depressed respiration, we wish to mention a paper on "Effect of Apnea Neonatorum on Intellectual Development" by Usdin and Weil, which appeared in *Pediatrics*, pages 387-393, April, 1952. These authors evaluated the intelligence of children 13 and 14 years old in a group of 41 children who had been apneic for three or more minutes at birth and in a group of 43 children who had breathed spontaneously at birth. The evaluation was made by the Stanford-Binet, Form L, Intelligence Test which was administered by a psychologist who did not know one group from the other. All children had been born in the Cincinnati General Hospital in 1937. The results of the study revealed a normal distribution of intelligence in the apneic group around a mean quotient of 96.2 as compared with 93.0 in the control group. The range of I.Q. in the apneic group was 71 to 130 and in the control group 69 to 129. One child who had had a ten-minute period of apnea at birth had an I.Q. of 105 and 2 children who had had five minutes of apnea at birth had I.Q.'s of 130, the highest I.Q. of both groups. The mean I.Q. of 17 children who had had apneic periods of four to six minutes at birth was 99.7. Thus, the statistical analysis of their results revealed no significant difference in the intelligence of the apneic and control groups.

TABLE I. VITAL STATISTICS

	NO.	%
Total no. delivered (1952-1953)	917	
Maternal mortality	0	
Section rate, total		3.5
Primary		1.0
Repeat		2.8
Viable prematures	44	
Surviving prematures	41	93.2
Fetal mortality: total	25	2.6
Stillborn	11	1.2
Newborn mortality:	14	1.4
Nonviable newborns	9	
Viable newborns	5	0.54

Table I shows our results. There was no maternal mortality, not only in these 917 cases, but in all delivered in this manner. The primary cesarean section rate is very low but cervical dystocia and uterine inertia are rare indications for section in a well-sedated labor and true cephalopelvic disproportion is less common than we formerly believed.

Of the 11 stillbirths, 6 were fetal deaths in utero long before labor or sedation began. Three of the 5 intrapartum deaths were in premature infants

TABLE II. SAMPLE CASES

CHART NO.	WEEK FROM LAST MENSTRUAL PERIOD	WEIGHT		INDUCTION	SPONTANEOUS	LABOR		SEDATION			DELIVERY		RESPIRATION		REMARKS
		POUNDS	OUNCES			HOURS IN LABOR	HOURS UNDER MEDICATION	DEMEROL (MG.)	SCOPOLAMINE (GRAINS)	BARBITURATE (GRAINS)	SPONTANEOUS	FORCEPS	SPONTANEOUS	CATHETER	
139625	40	7	6		x	24	22	1,000	1/15	Luminal, 3	Breech ext.			x	Primipara
139597	39	?		x		3½	5½	500	1/30	Luminal, 3	O.A.		x		Pre-eclampsia with complete absence of one kidney
131495	40	8	2		x	8	2	400	2/75	Luminal, 3		Low	x		"Flu" with temp. of 101° F.
112538	40	8	5		x	49	48	2,400	10/75	Luminal, 3 Tuinal, 6		Scanzoni	First, 30 sec. Established, 40 sec.		Primipara. Rigid cervix. Contractions painful, 5-10 minutes first 24 hours if not well sedated
131640	41	8	8		x	7	3	400	2/75			Low	x		Manual removal of adherent placenta

137196	40	11	15	x		7	9	500	1/30	Luminal, 3	O.A.		x		Large baby. Sedated before induction
136492	39	6	8	x		3	4	300	1/50	Luminal, 3	O.A.		x		"Ideal" case
133242	40	5	15	x		5½	6	400	1/75	Seconal, 3		Low		x	Multipara. Separation of placenta just before delivery
134208	40	6										Low	x		Primipara. Twins
		5	8		x	3½	3	350	1/75	Seconal, 3		Low	x		
140950	40	?			x	22	21	1,100	7/150	Tuinal, 6 Seconal, 3		Scanzoni Low mid.		x	Primipara. Long, Difficult labor and delivery
137397	40	7	3		x	8	6	600	1/60	Seconal, 3		Low	x		Primipara
137156	40	7	11	x		5	5½	600	1/75	Seconal, 3		Low	x		Primipara
136483	40	5	8		x	3½	1½	200	1/100	Seconal, 3		Low	x		Multigravida
137920	40	8	3		x	3	1¼	250	1/100	Tuinal, 3		Scanzoni	x		Multigravida
127847	38	6	2		x	6?	1	250	1/75	0		Low	First, 5 sec. Established, 20 sec.		Admitted late in second stage. Thick vaginal septum
130263	40	9	5	x		2	3	300	1/100	Seconal, 3	x		x		

The usual dosage is 300 mg. Demerol with $\frac{1}{150}$ gr. scopolamine for four hours of labor. The amount depends on the emotional factor of the patient and the character of the labor rather than the weight of the patient.

that weighed under 3 pounds; in 2 cases there was complete abruption of the placenta and in the third a central placenta previa with the placenta preceding the buttocks at delivery. The 2 larger babies were also lost because of complete abruptio, these in severely toxic mothers. The anesthesia was not a factor in any of these deaths.

Study of the 14 deaths of newborn infants reveals 9 nonviable infants. Three were "immature," weighing 1 pound, 2¼ pounds, and 1 pound, 10 ounces, at 24, 23, and 24½ weeks' gestation. The fact that they breathed spontaneously and lived 1½ to 2 hours is good evidence that they were not depressed by the sedation of 250 to 600 mg. of Demerol. Four babies had congenital anomalies incompatible with life; a large teratoma of the sacrum which had to be aspirated before delivery could be completed, chondrodystrophy, anencephaly, and an omphalocele with intestinal atresia in a 3 pound premature that died three days after successful surgical repair. The other two nonviables were erythroblastotic infants with hopeless hydrops that lived less than two hours.

This leaves only 5 viable newborn infants that did not survive, a 0.54 per cent neonatal mortality; and only two (0.21 per cent) of these weighed over 4 pounds at birth.

Since all except one of these 14 babies breathed spontaneously at birth, we do not believe the sedation contributed to the mortality. The one case in which the tracheal catheter was used was on a 31 week premature infant that lived 19 hours.

An analysis of the surviving premature infants accents the safety of this anesthesia for babies. By weight and gestation, we have 44 viable prematures, omitting a number of 5 to 6 pound babies believed to be above 37 weeks' gestation. Forty-one of these prematures survived, the other 3 are described above. The period of gestation was from 26 to 37 weeks from the last menstrual date, and weights from 2 pounds, 12 ounces, to 5 pounds, 15 ounces (36 weeks). During 1954, 3 of our prematures that survived weighed less than 2½ pounds. More Demerol per hour was used in these labors than in the normal cases because of the complications accompanying the premature labor: twenty patients were sedated for less than 3½ hours with 200 to 400 mg. of Demerol, 15 had 300 to 650 mg. in 4 to 10 hours' sedation, and 2 were partially sedated for over 50 hours with 900 and 2,200 mg. of Demerol with corresponding doses of scopolamine. The tracheal catheter was used twelve times in these 44 prematures; remember that it is inserted within one minute in any pallid baby. The catheter was used in the cases with the more serious complications of labor: toxemias, hemorrhage, including one with complete separation of the placenta just prior to delivery, one with occult prolapse of the cord with fetal heart below 80 during contractions and midforceps to rush delivery. No relationship can be demonstrated between the amount or time of the Demerol and the necessity for resuscitation. The premature babies whose mothers received 2,200 mg. in 56 hours, 200 mg. in 30 minutes, 650 mg. in 9 hours, 500 mg. in 4 hours, all breathed spontaneously.

Of these 44 viable prematures, only 3 did not survive. These small prematures had good nursing and pediatric care but the results could not have been so good if they had been "depressed" at birth. This gives a survival rate of 93.2 per cent for premature infants.

These 917 cases were analyzed to show the dosage, the variation, and the wide margin of safety. The minimum satisfactory amount was 200 mg. in a multipara delivered within an hour of admission. The maximum amounts used were 300 mg. in a 45 minute period and 2,400 mg. in 48 hours. The usual amount is 100 mg. every two to four hours in the early first stage, every hour during hard labor; multiparas receive 400 mg. and primiparas 600 mg. True averages are not given since the occasional prolonged labor or precipitate delivery destroys their value. The Demerol is given in amounts necessary to relieve pain, irrespective of the stage of labor; and the emotional status of the patient, not the dilatation of the cervix, determines the dose (Table II).

With the method of conducting labor and delivery which we have described in this paper, we have performed all the difficult deliveries and procedures which one is likely to encounter in the practice of obstetrics. We have handled all of the following with no additional anesthesia, although an anesthesiologist was sometimes called but not used when trouble was anticipated: (1) manual rotations, (2) forceps rotations, (3) conversions of face presentations, (4) face presentations, (5) midforceps, (6) breech presentations, (7) twins, (8) triplets, (9) version and extraction of the second twin, (10) Dührssen's incisions and repair, (11) repair of cervical lacerations, (12) vaginal repairs: vault, "gutter," rectal-wall defect above intact sphincter, heavy anteroposterior vaginal-septum repair, repair of a third-degree laceration, (13) manual removal of placenta or membranes, (14) hypertensive and rheumatic heart disease; decompensated, (15) abruptio and placenta previas, (16) prolapsed cord, (17) "normal" deliveries.

All manipulations are coordinated with, and take advantage of, the mother's normal muscle tone and activity. For example, forceps are not forced in while she is bearing down, and versions are done between contractions.

Summary

1. We have presented a method or technique of conducting labor and delivery using Demerol and scopolamine both intravenously and intramuscularly, barbiturates orally, and oxygen by mask. No inhalation anesthetic, caudal, saddle block, or infiltration anesthetic is necessary for delivery. This is an advantage as it is frequently impossible to get a competent anesthetist at the time of delivery, and, too, the patient is spared the anesthetic fee.

2. We have shown to our satisfaction that Demerol and/or scopolamine are safe for both mother and baby and may be repeated intravenously or intramuscularly as often as necessary during labor and delivery.

3. Demerol does not retard or stop labor and asphyxia neonatorum is reduced to a minimum. Blood pressure is not adversely affected by Demerol.

4. Administration of these drugs may be carried out by any competent nurse.

5. This method of conducting labor and delivery is most pleasing to both the patient and her family and more "normal," shorter labors result.

6. We have stressed the importance of the intratracheal catheter in resuscitating newborn infants and pointed out that there are many causes for asphyxia neonatorum besides drugs.

7. We have presented our vital statistics for the past two years and the typical doses of barbiturates, Demerol and scopolamine we give our patients.

8. We have presented sample cases to illustrate the wide margin of safety of these drugs.

Discussion

DR. M. A. DAVIDSON, Marlin, Texas.—Any paper that offers a less painful method of childbirth and at the same time offers safety to both mother and baby deserves the serious attention of obstetricians. Like the authors of this paper, it is hard for me to comprehend the much publicized exhilarating effect and euphoria that the mothers are reputed to obtain from the so-called natural childbirth.

For years we have used Demerol-scopolamine analgesia followed by terminal inhalation anesthesia but we have had no experience with its intravenous use nor with such courageous dosage. Therefore, I am not prepared to discuss the real heart of this paper. It is, however, a most interesting presentation.

When we examine the charts presented and note the massive doses that many of these patients received and find no maternal deaths in over 900 deliveries, it makes us wonder just what would be the lethal dose of these drugs. It certainly proves that they have a wide margin of safety. Furthermore, when we see the number of babies that breathed spontaneously and the number of prematures that survived, we are then led to believe that terminal inhalation anesthesia is more depressing to the respiratory center of the newborn than Demerol and scopolamine. On the other hand, it is to be noted that the essayists have used the tracheal catheter fairly frequently, which indicates that they have encountered some respiratory depression as a result of narcosis. Their more frequent use of the tracheal catheter may be explained on the basis that they have resorted to its use much sooner than we have done. We feel that the tracheal catheter is very important in the delivery room, but that it is not without danger to the newborn. It may result in neonatal pneumonia or in laryngeal edema and we feel that any baby on whom the tracheal catheter has been used should receive penicillin prophylactically. Before inserting the tracheal catheter we administer a respiratory stimulant by way of the umbilical vein and we believe that if the respiratory depression is due only to narcosis this stimulation will usually result in prompt respiration. If respiration does not become established after this stimulation we feel concerned about the baby as anoxia is rapidly developing and we immediately insert the tracheal catheter. Long periods of apnea should not be taken lightly.

The operative incidence in this whole series has not been presented here, but in the 100 sample cases that were presented it is to be noted that there were 20 Scanzoni forceps operations and 18 low-mid- or midforceps operations. If this is an index to the operative incidence in the entire group we feel that it is high.

DR. PASSMORE (Closing).—The sample cases were chosen to show dosage. We have far more spontaneous deliveries and less "operative obstetrics" than we had with inhalation anesthesia, and fewer rotations than are reported with regional blocks.

ROUTINE POSTPARTUM USE OF PESSARIES*

DONALD M. PATON, M.D., HOUSTON, TEXAS

(From the Department of Obstetrics and Gynecology, Baylor University School of Medicine, and the Department of Obstetrics, Memorial Hospital)

IT HAS long been thought that knee-chest exercises are beneficial in the prevention of retroversion of the postpartum uterus. If knee-chest exercises taken for a few minutes daily can help to prevent retroversions then the placing of a pessary in the vagina should accomplish much more by keeping the uterus constantly in a forward position. This also eliminates the possibility of failure to obtain the patient's cooperation. To the best of my knowledge, Dr. Otto Krebs of St. Louis first conceived the idea of using the postpartum pessary for this purpose in 1921 and although he has never published his work, he should receive the credit for the idea.

In recent years retroversion of the uterus has come to be of much less importance than formerly. Yet an occasional patient still finds that the acquired retroversion is the beginning of a long chain of symptoms which end eventually in a prolapse. One of the objects of good obstetrics is to leave the patient as normal as she was before her pregnancy.

Method

From 880 consecutive deliveries among my private patients results have been obtained in 500 cases in which the patient wore the pessary the required length of time and reported for regular routine check-ups (Table I). In each case the pessary was inserted in the office on the eighteenth to the twenty-first day post partum. The majority of the patients were treated on the eighteenth day, this day being chosen because it was found that less than one in three acquired retroversions prior to the twenty-first day.

TABLE I. NUMBER OF CASES TREATED WITH AND WITHOUT PESSARY

	PESSARY GROUP	WITHOUT PESSARY GROUP
Total	*500*	*100*
Primiparas	265	48
Multiparas	235	52

The patient was routinely discharged from the hospital without any instructions for knee-chest position and told to return for the first office visit on the eighteenth postpartum day. If she appeared not later than the twenty-first day she was included in the series. The pessary was inserted at this visit and the patient was instructed to leave it alone and to reappear for examination six weeks post partum. At the examination at six weeks the pessary was removed and the patient was instructed to return three months post partum for a final check.

*Presented at the Twenty-fourth Annual Meeting of the Texas Association of Obstetricians and Gynecologists, Austin, Texas, Feb. 14 to 16, 1953.

A patient who was found to have a retroversion at the examination on the eighteenth day was fitted with a pessary and placed on knee-chest exercises for three days. Only rarely was an attempt made to replace the uterus manually. At the end of three days the uterus was usually found in a forward position. If it were still retroverted, the pessary was checked and refitted if necessary. At the end of a second three-day period the uterus was again checked and if still retroverted the pessary was removed and the patient advised to take knee-chest exercises till the sixth week post partum.

Results

Results obtained with the pessary in primiparas and multiparas are presented in Table II. These two groups are considered separately because of the influence of retroversions acquired from previous deliveries in the group of multiparas. Table I shows that 265 primiparas were treated with the postpartum pessary while 48 were treated without the pessary; 235 multiparas were treated with the pessary and 52 without the pessary. Table II shows that 23 per cent of the primiparas and 26 per cent of the multiparas treated with the pessary had a retroversion of the uterus at the examination three months post partum. This compares favorably with the figures of 31 per cent and 38 per cent in the corresponding groups treated without a pessary. In the pessary-treated group only 32 primiparas, or 14 per cent, and 13 multiparas, or 7 per cent, exhibited an unexplained or "acquired" retroversion at the examination at three months.

TABLE II. RETROVERSIONS FOUND IN CASES TREATED WITH AND WITHOUT PESSARY AT THE FINAL EXAMINATION THREE MONTHS POST PARTUM

	PESSARY GROUP		WITHOUT PESSARY GROUP	
	CASES	PER CENT	CASES	PER CENT
Primiparas	60	23	15	31
Multiparas	60	26	20	38

The group with acquired retroversions included all those patients in whom no retroversion was present prior to pregnancy or delivery either by history or examination (Table III). Obviously a number of these patients would have fallen into the group with previous retroversions if we had had a more accurate history or an opportunity to examine the patient prior to pregnancy. Here again the pessary-treated groups compare favorably with the corresponding figures of 20 per cent and 21 per cent in the groups treated without the pessary. These figures make no distinction between retroversions which existed prior to the time of delivery and retroversions found at final examination for the first time.

TABLE III. ACQUIRED RETROVERSIONS AT FINAL POSTPARTUM EXAMINATION IN PATIENTS WITHOUT PREVIOUS HISTORY OF CONDITION

	PESSARY GROUP		WITHOUT PESSARY GROUP	
	CASES	PER CENT	CASES	PER CENT
Primiparas	32	14	7	20
Multiparas	13	7	7	21
Primiparas and multiparas	45	11	14	20

Patients With Retroversion of the Uterus Existing Prior to the Time of the Examination Three Months Post Partum.—

There were 37 primiparas and 60 multiparas in this group (Table IV). Of this number 62 retroversions were recognized by examination and 35 by history alone, the diagnosis being made by both history and examination in 31. The incidence of previous retroversion is therefore nearly twice as great in the multip-

aras as in the primiparas, 14 and 26 per cent, respectively. The difference is natural because of the greater accuracy of history on this point and previous examination of the multiparas and also because of the greater incidence of acquired retroversions in the multiparous group. The relation of the retroversion to the stage of the pregnancy is interesting and shows that 70 per cent of all the patients who exhibited retroversions had such findings early in pregnancy. Four retroversions in this group were diagnosed before pregnancy also. In 23 per cent of the patients with retroversions, the previous retroversion was found only before pregnancy, and in 4 cases, or 7 per cent, the previous retroversion was found only in a previous pregnancy but not in the pregnancy under consideration. Forty-five per cent of the patients who exhibited retroversion gave histories of having had retroversions prior to the first pregnancy and 55 per cent gave histories of retroversion after some previous pregnancy. Undoubtedly the 10 per cent difference is partly accounted for by acquired retroversions.

TABLE IV. RETROVERSIONS FOUND AT EXAMINATION THREE MONTHS POST PARTUM IN PATIENTS WITH KNOWN RETROVERSION BEFORE OR DURING PREGNANCY

	PESSARY GROUP		WITHOUT PESSARY GROUP	
	CASES	PER CENT	CASES	PER CENT
Primiparas	37	14	13	27
Multiparas	60	26	18	35
Primiparas and multiparas	97	19	31	31

Significance of the Examination on the Eighteenth Day.—

It is interesting to note that 70 patients, or 14 per cent of the entire series, showed retroversions at the examination on the eighteenth pospartum day. Thirty-nine patients, or 40 per cent of all the patients who had histories of previous retroversion, exhibited retroversions on the eighteenth day after delivery. Twenty-six patients had retroversions at eighteen days and a normally placed uterus at the examination at three months. Of the group of patients who were finally classed as having acquired retroversions, only 28 per cent exhibited retroversions the eitheeenth day post partum. This would probably mean that more than 70 per cent of the acquired retroversions occurred after the eighteenth day following delivery.

Cured Retroversions.—

An interesting group is composed of 22 patients who had retroversions prior to or early in pregnancy and who had no retroversion at the examination at three month. These are presented in Table V. The group comprises 21 per cent of all patients who had previous retroversions. Of these so-called "cured" retroversions, 70 per cent were orginally found by examination, 30 per cent by history. Ten of the group had retroversions early in pregnancy. The possibility exists that these 10 represent a transitory retroversion which was present only in very early pregnancy due to the heavy uterus, and at no other time. Seven of the 22 patients had retroversions for a brief time after delivery but not at the three months post partum examination.

TABLE V. CURED RETROVERSIONS. PATIENTS WITH KNOWN RETROVERSION BEFORE DELIVERY AND NO RETROVERSION AT EXAMINATION THREE MONTHS POST PARTUM

	PESSARY GROUP		WITHOUT PESSARY GROUP	
	CASES	PER CENT	CASES	PER CENT
Primiparas	9	24	5	38
Multiparas	13	22	5	28

Unfortunately, it was possible to check only 5 of these 22 patients at subsequent examinations. In 2 patients the uterus was still forward at nine and fourteen months, respectively, after delivery. In 2 others it was retroverted early in and after subsequent pregnancy a year later. The fifth patient showed no retroversion at any time during or following a pregnancy four years later but she wore a pessary for eight months post partum.

It can be seen from these figures that the "cured" retroversion may not be all that it seems to be. Later, in discussion of the cases rejected because of inconsistent findings, it will be seen that many patients will have retroversions at one time and not at another without apparent cause for the change. Reference to Table IV shows that in the group of patients in whom the pessary was not used, 5 multiparas and 5 primiparas, there was a higher percentage of so-called "cured" retroversions than in the group where the pessary was used. We must conclude that the pessary itself does not seem to have much to do with the disappearance of a retroversion which had existed prior to the pregnancy.

Table IV presents patients with known retroversion prior to the time of delivery. It is interesting to note that 19 per cent of all the patients selected for pessary treatment had a pre-existing retroversion. In the group of patients who were treated without the pessary the incidence of pre-existing retroversion is 31 per cent, considerably higher than is to be found in the pessary-treated group.

Cases Not Included in the Pessary Group.—

In establishment of the series of 500 cases treated with pessaries, there were actually 880 patients eligible for such treatment but 380 patients were eliminated for the following reasons:

147 Inadequate postpartum examination.
47 Inconsistent findings (these will be presented separately).
30 First postpartum examination after twenty-first day.
28 Cesarean sections.
21 Patient complained that pessary hurt.
21 Patient could not be properly fitted.
18 Patient delivered before viability.
16 Patient wore pessary beyond six weeks.
15 No response to pessary treatment.
12 Pessary removed before examination six weeks post partum.
9 Previous suspension operation.
8 Patient refused to wear pessary.
4 Indefinite findings.
2 Episiotomy not satisfactorily healed.
1 Indefinite parity.

Patients Who Failed to Respond to Treatment.—

There were 15 patients eliminated from the series because of failure to respond to pessary treatment (1.7 per cent). As was stated earlier, a retroversion found on the eighteenth postpartum day was rarely manipulated but instead a pessary was inserted and knee-chest exercises were prescribed. With few exceptions the uterus was in a forward position at examination a few days later. In a few cases where the first pessary was too small or the patient failed to cooperate, this procedure was repeated, usually with success.

The 15 cases mentioned here were so treated, but the uterus failed to come forward. In each case the pessary was removed and knee-chest exercises prescribed until six weeks post partum. Thirteen of these patients had previous retroversions. Of the remaining 2, one was doubtful, as the initial examination

was made at five months' pregnancy and in both patients the uterus was forward three months post partum. Final examination showed the uterus retroverted in 10 cases; forward in 4; and forward and retrocessed in 1.

Patients Excluded From the Series for Special Reasons.—

Forty-seven cases were rejected from the series because of indefinite or inconsistent findings at the time of postpartum examination. They are summarized as follows:

In 6 patients with retroversion three months post partum, the uterus later was found to be forward. Three were primiparas and 2 multiparas. One of the primiparas had a previous retroversion.

In 2 patients, 1 primipara and 1 multipara, the uterus was forward at three months post partum and later was found to be retroverted. The primipara had a previous retroversion.

Fourteen patients were eliminated because the uterus was retrocessed in spite of the fact that it was in a forward position. Seven were primiparas and 7 multiparas. Only 1 patient, a primipara, had a previous retroversion.

Four patients were eliminated because of a retrocession that later disappeared.

Five patients were eliminated because of a retrocession that later presented a true retroversion. Three of these had a previous retroversion.

Fifteen patients were eliminated because the uterus showed a tendency to tip backward. Ten of these were normal three months post partum and 5 had retroversion. Of the 10 who were normal, 2 had a previous retroversion. Of the 5 with retroversion, 4 had a previous retroversion.

Two patients were eliminated because of questionable histories of previous retroversion.

Comment

The results obtained from this study are not conclusive from a statistical standpoint. A figure of 11 per cent acquired retroversions in the pessary group compared to 20 per cent in the group not using the pessary would be regarded as impressive until we remember that the latter group comprised only 100 patients (Table V).

Several conditions would have to be fulfilled in order to make the study reliable on a statistical basis. Ideally, all the patients should have been examined before pregnancy began. This of course would be impossible in private obstetrical practice. To compare the group of pessary patients with a group of comparable size using exercises would be the next best procedure. This I have done as nearly as possible, but, as previously stated, the group is not large enough.

Apart from statistical evidence, the care of the postpartum patient who uses the pessary instead of the knee-chest position has seemed much more satisfactory. I rarely nowadays have a patient who complains of backache after the six postpartum week. Furthermore, although I see as many cases of postpartum cervicitis as before, the area involved is smaller than was the case when treatment depended entirely on exercises. This improvement in the condition of the cervix is possibly not due so much to the use of the pessary as it is to the employment of Floraquin tablets which I added to the routine use of hot vinegar douches about the same time I adopted the pessaries. When patients who wear the pessary fail to use the tablets and douches the degree of cervicitis is usually fairly severe.

Involution of the uterus is, I believe, improved by the use of the pessary. I do not have exact figures to substantiate this opinion, but I rarely see frank subinvolution. Again the pessary cannot get all the credit. Within the past year I have added to my routine the use of Ergotrate on the seventh postpartum day, the patient having already received a course of Ergotrate in the first twenty-four hours after delivery.

I would like to quote the conclusions from Dr. Krebs' unpublished manuscript. These paragraphs he included in a recent letter which he wrote to me after reading my paper.

"In conclusion I think that by a regime such as we have followed in this series of patients with application of pessary at the time of discharge of the patient from the hospital at 2 weeks postpartum, and the attempt at maintenance of an acid pH in the vagina during the period of greater involution, we can promise with a high degree of certainty any primiparous woman we see with a forward uterus during early pregnancy that she is practically assured of the uterus being in that position at the end of the puerperium. That is, there are no acquired displacements in the primiparae following childbirth. In the multiparae, we feel that we cannot guarantee anything in the way of correcting a displacement which has resulted from a previous confinement. However, in the primiparae and the multiparae, we feel that by caring for them in the fashion described, involution will be better and the incidence of erosion will be distinctly less.

"Another point I wish to mention is that I do not think that 6 weeks postpartum is a sufficiently late time to consider as the end of puerperium; in many instances a considerable degree of involution still takes place thereafter."

Postpartum menorrhagia of the delayed type has not been improved. Whether this is due to early rising or to the use of stilbestrol for drying up the breasts, even though given in small doses, I cannot say. I believe that postpartum menorrhagia is as troublesome to me as it is to other obstetricians.

The feeling of greater general well-being of the patient and her freedom from backache, and my own feeling of satisfaction in believing that after delivery I can quickly separate the congenital retroversions from the acquired—these are the chief benefits derived from the use of the pessary. Of course there may be other reasons for my not seeing persistent backaches. Since I practice only obstetrics, maybe these patients wander off to a gynecologist. Maybe I am so convinced in my own mind that the pessary prevents acquired retroversions and leaves only the congenital retroversions which are symptomless, that I persuade the patient to believe this and thus treat her psychologically. The question is difficult to answer.

No doubt mistakes have been made in the compilation of these figures. These have been honest mistakes due largely to the impossibility of correctly evaluating every patient. Reference to the group of specially rejected cases in which some patients had a normally placed uterus at the examination three months post partum and a retroversion later, or vice versa, easily demonstrates the truth of the statement. If all the patients included in this study could

have been examined at monthy intervals for a year after delivery, I am sure that the statistics obtained would change radically. Then, again, it was not always possible to fit the patient properly with the pessary. In some cases the uterus retroverted with the pessary in the vagina. I am sure that there were other cases where retroversion would have occurred in spite of the pessary if the tendency had been there.

An obvious source of error lies in the fact that many of the patients were not examined before pregnancy. This applies mostly to the group of primiparas. For this reason I believe that the statistics in the multiparous patients are more reliable. Even here, however, I frequently depended on history and this of course was not always dependable. Considering multiparas alone, the incidence of acquired retroversion was 7 per cent, only one-third of that found in the exercise group.

Conclusion

In the conclusion I should like to repeat that these figures may not be statistically significant but it is my impression that the method is excellent. After having made the 3,500 pelvic examinations from which my statistics were gathered and having noted the varying positions of the uterus at different times, I doubt if any study, no matter how well controlled, could be completely reliable on a statistical basis.

4611 Caroline Street
Houston 4, Texas

Original Communications

A STUDY OF ENVIRONMENTAL FACTORS IN CARCINOMA OF THE CERVIX*

ERNEST L. WYNDER, M.D., JEROME CORNFIELD, B.S., P. D. SCHROFF, M.B., B.S., F.C.P.S., AND K. R. DORAISWAMI, M.D., NEW YORK, N. Y.

(From the Division of Preventive Medicine of the Sloan-Kettering Institute, Memorial Center, New York, New York; The Office of Biometry of the National Institutes of Health, Public Health Service, Department of Health, Education, and Welfare, Bethesda, Maryland; The Department of Surgery of the Tata Memorial Hospital in Bombay, India; and the Department of Radiology of the Premier Radiological and Cancer Institute, Madras, India)

THE present communication represents a study of the possible role of environmental factors in the production of cervical cancer. It is based upon a clinical-statistical study carried out jointly in the United States and in India.

The incidence of cervical cancer and the various suggested factors believed to have influenced these rates have served as a primary stimulus for the present investigation. We shall, therefore, briefly review the incidence of cervical cancer as encountered in various population groups and outline the factors suspected to have influenced this incidence pattern.

Incidence

General.—The uterine cervix is the second most frequent site of cancer in American women, accounting for approximately 10 per cent of all newly diagnosed cases and for about the same percentage of total cancer deaths. In different American cities its annual incidence varies from 30 to 60 per 100,000 females.[1] The incidence rates are about the same in Western Europe.[2] Scattered reports from Asia suggest that in these countries the uterine cervix is the most important site and may account for 40 or more per cent of all newly diagnosed cases of cancer.[3-6]

Jews.—The incidence of cervical cancer is far from uniform in different population groups. As early as 1906, Vineberg[7] was impressed with its infrequency among Jewish women. Since that time similar reports have emanated from Germany, Austria, England, Hungary, Holland, and various American centers.[8-17] Some American data have been summarized in Table I.[18-19] This relatively low frequency of cancer of the cervix in Jewish women, which appears uniform, has been well summarized by Sorsby,[21] Wolff,[22] Davidsohn,[23] Sugar and Levy,[20] and more recently by Kennaway.[24]

Fijis.—Handley[25] calls attention to the relatively low frequency of cervical cancer among Fijis. A review of hospital records from the Fiji Islands,

*Presented at a meeting of the New York Obstetrical Society, Nov. 10, 1953.

where 70,000 Indians and 90,000 Fijis live, shows 26 carcinomas of the cervix among the Indians and only 3 among the Fijis.

TABLE I. RELATIVE INCIDENCE OF CARCINOMA OF THE CERVIX IN JEWS AND NON-JEWS AT THREE AMERICAN HOSPITALS

HOSPITAL	YEARS	TOTAL CASES OF CERVIX CANCER	INCIDENCE OF CANCER OF THE CERVIX IN NON-JEWS RELATIVE TO THAT IN JEWS
Mt. Sinai, New York	1893-1906	18	17.0 : 1
	1909-1918	85	12.5 : 1
	1928-1948	323	5.3 : 1
Bellevue, New York	1925-1945	1,317	5.9 : 1
Memorial Center, New York	1916-1937	3,106	8.5 : 1

Moslems.—Moslem women have a low frequency of cervical cancer as compared to other religious groups in their community. A report from the Institute of Pathology in Indonesia covering the period 1939 to 1949 shows 1.6 per cent of Indonesian female patients and 4.9 per cent of the Chinese female patients to have cancer of the cervix. In Indonesia, 90 per cent of the Indonesians, but none of the Chinese, are Moslems.[26] We show in Table II the frequency of cervical cancer in two hospital populations in India among different religious groups. In both hospitals cervical cancer is much less frequent among Moslem than among Hindu women.

TABLE II. CERVICAL CANCER AS A PERCENTAGE OF TOTAL FEMALE CANCER ADMISSIONS AT THE TATA MEMORIAL HOSPITAL, BOMBAY, 1941-1950, AND THE PREMIER RADIOLOGICAL INSTITUTE AND CANCER HOSPITAL, MADRAS, 1950-1952

	TATA MEMORIAL		PREMIER RADIOLOGICAL INSTITUTE	
	TOTAL FEMALE CANCER ADMISSIONS	PER CENT CERVIX CANCER	TOTAL FEMALE CANCER ADMISSIONS	PER CENT CERVIX CANCER
Hindus	3,828	45	280	53
Christians	575	29	60	29
Moslems	818	16	67	18
Parsis	396	13	—	—

Negroes.—Recent incidence studies by the U. S. National Cancer Institute show a uniformly higher incidence of cervical cancer among Negroes than among whites[1] (Table III), a finding supported by several hospital studies.[27-29]

TABLE III. NUMBER OF NEWLY DIAGNOSED CASES OF CERVICAL CANCER PER 100,000 FEMALES, WHITES AND NONWHITES*

CITY	WHITE	NONWHITE
New Orleans	59	72
Chicago	28	65
Dallas	44	65
Birmingham	52	73
Detroit	37	54
Philadelphia	33	65

*Source: Federal Security Agency, Public Health Service, Cancer Morbidity Series, No. 1-10, 1950-1952.

Low-Income Groups.—Carcinoma of the cervix occurs more commonly in the lower income groups. The Registrar General of Great Britain[30] shows that

the lower the social class, the higher the mortality of cervical cancer. Similarly, Clemmesen[31] shows that in Copenhagen carcinoma of the cervix occurs more commonly in the low-priced housing districts.

Marital Status.—Numerous authors have found a lower incidence of cervical cancer among single women. Stocks[32] finds that "Liability to cancer of the cervix uteri is greater at every age amongst married and widowed women than amongst single women, and especially between the ages of forty-five and sixty-five, when it is about seven times as great." Maliphant[33] points out that, "A woman who has reached the age of thirty-five or more has twice the risk of contracting cancer of the cervix if she is married." Similar results are reported by Dorn,[34] Lombard and Potter,[35] and Gilliam.[36] Gagnon[37] points to the apparently very low incidence of cervical cancer among nuns. Among one group of nuns studied in Canada, Gagnon found twelve cancers of the body of the uterus, but none in the cervix. In another group of 130 neoplasms among nuns, there were again no carcinomas of the cervix.

Prostitutes.—A recent Danish survey by Rojel[38] shows prostitutes are four times as numerous among women with cancer of the cervix as among other women of comparable socioeconomic groups.

Suggested Etiological Factors

There have been numerous attempts to explain these variations among the different population groups by implicating possible etiological factors which vary in intensity in the same fashion from group to group.

Circumcision.—One of the earliest to suggest lack of circumcision as a possible etiological factor was Handley, who points out that of those groups which have a low frequency of cervical cancer (Jews, Fijis, Moslems), all practice circumcision of their male population. In 1936, he[25] wrote, "There is evidence that the existence of phimosis, or in its absence carelessness as to subpreputial hygiene and cleanliness, is a menace even more serious to the female sex than to the sex in which they originate." Khanolkar[39] also draws attention to the fact that the Moslems in India, who do circumcise their males between the ages of 6 and 12, have a relatively low frequency of cervical cancer.

The Ritual of Abstinence.—Kennaway, in an admirable review of carcinoma of the uterus in which he particularly stresses the low incidence of cervical cancer in Jewish women, states that the data suggest one cause for this low incidence to be "a factor that is opposed by the Jewish practice of abstinence from sexual intercourse during most of the first half of the ovulatory cycle." Kennaway[24] points out that the Parsis, who have a relatively low frequency of cervical cancer, are also supposed to have a period of abstinence after menses. Vineberg,[40] as well as Sorsby[21] and Smith,[14] also attributes significance to this factor. Weiner[18] and his associates suggest that the apparent greater frequency of cervical carcinoma in Jewish women today, as compared to the beginning of this century, might possibly be explained by a greater laxity of Jewish women in following the law of abstinence.

Other Racial Factors.—Several authors believe that the low incidence of cervical cancer in Jews is based upon a genetic immunity of Jewish women to cervical cancer, as stressed by Maliphant.[33] Clemmesen[41] also recently suggests that the rare incidence of cervical cancer in Jewish women may be based upon "a special hormonal status in these women."

Hormones.—Animal experimentation has shown that estrogen administration can increase the incidence of cervical cancer in susceptible mice.[42] Hofbauer[43] feels that excessive ovarian stimulation in multiparous women might be of etiological significance. Ayre[44] believes estrogen to be a growth-stimulating factor to cervical cancer. He found that 90 per cent of 50 patients with cervix cancer had evidence of excessive tissue estrogens on the basis of vaginal and cervical cornification. Khanolkar[39] theorizes that women in the lower income groups with resulting inadequacy of diets might develop liver dysfunction and subsequently might have a higher hormonal blood level because the damaged liver is unable to detoxify the estrogens. On the basis of associated endometrial hyperplasia, Bainborough[45] proposes that excessive estrogen stimulation is a factor in the production of cervical cancer, a conclusion denied by Bayly and Greene,[46] who find no significant degree of endometrial hyperplasia among patients with cancer of the cervix. Nieburgs[47] advances the contrasting idea that low estrogen levels might be of etiological significance. Lombard and Potter[35] propose that hormonal factors may account for earlier marriage and high divorce rates among patients with cervical cancer.

Low Economic Status.—Kennaway[24] emphasizes a factor as responsible for a high incidence of cervical cancer, "a factor that is intensified in those married and single women by descent in economic scale." Lombard and Potter[35] suggest that low economic status has possible etiological significance, stating, "Concomitant with low economic status are such factors as: poor obstetrical care, improper housing, and poor nutrition." Smith[14] believes that "poor obstetrical care and post partum care and neglect of symptoms of the lacerated and ulcerated cervix account for the greater frequency of cervical cancer among the poorer classes." Clemmesen[41] also observes a higher incidence with low economic status, but emphasizes that rural areas in Denmark have a relatively low incidence of cervical cancer compared to the low-income city areas. He believes that sexual activity may be the common denominator to account for this observed incidence difference. Vineberg's[40] opinion, stated in 1919, is recalled with interest. "When one stops to consider that the total number of Jewish women, 1,995, had badly lacerated cervices . . . and that they were living in the worst possible hygienic surrounding, amidst the greatest squalor and privation, such as obtained in the lower East Side of the Metropolis, it is truly remarkable that so few cases of cancer of the cervix were detected amongst them."

Diet.—Khanolkar feels that cancer of the cervix is most common in Hindu women who have a badly balanced and deficient diet, especially during the childbearing stage, and considers this to have a possible effect upon the liver. Horwitz[15] considers ritual dietary laws among orthodox Jewish women to

be of possible etiological significance. Ayre[44] proposes that deficiencies of thiamine and riboflavin might lead to a greater susceptibility of cervical tissues to cancer formation.

Chronic Cervicitis.—Gagnon[37] places strong emphasis on chronic cervicitis as an etiological factor in cervical cancer. He states that in over 3,000 cases of chronic cervicitis, systematically treated, no cervical carcinoma was seen, and that the rarity of chronic cervicitis in virgins accounts for the low inidence of cervical cancer among them. He states, "The eradication of cervicitis equals the suppression of cancer of the cervix." McKelvey[48] states that the factor of cervicitis could not account for the low incidence of epidermoid carcinoma of the cervix among Jewish women, who not uncommonly have chronic cervicitis.

Unrepaired Lacerations.—Ewing[49] suggests unrepaired lacerations of the cervix to be of etiological significance in cervical cancer. Lombard and Potter[35] find 26 per cent of their patients with cancer of the cervix and 13.2 per cent of their matched controls to admit to cervical lacerations. They state that the "relationship between cancer of the cervix and unrepaired lacerations remained significant when partial correlations were computed."

Coal-Tar Douching.—Lombard and Potter[35] find suggestive, though not conclusive, evidence that coal-tar derivatives are of etiological significance in cervical cancer. Smith[14] notes no significant difference in the type of douches used by Italians and Jews in his study.

Syphilis.—Several authors have reported a positive association between syphilis and cervical cancer, a subject well summarized by Levin and his associates.[50-52] Wallingford[53] suggests that the greater frequency of coitus suspected among women with syphilis may account for their greater chance of developing cervical cancer.

Pregnancy.—A positive association between the number of pregnancies and cervical cancer has been reported by some and denied by others.[33, 35, 36] Clemmesen[54] finds that the difference in the Danish incidence data from town and country cannot be explained by a simple direct relationship between birth rate and cervical cancer. Denoix[55] arrives at a similar conclusion on the basis of French data.

Vaginal Discharge.—Hausdorff[56] suggests vaginal discharge as a causative factor in the production of cervical cancer.

The Present Study

In this investigation we have attempted to appraise those of the suggested factors that can be evaluated by an interview study. Some of these, such as circumcision, are well suited for study by means of an interview with a group of cervical cancer patients and suitable controls. Thus, if the difference in the incidence of cervical cancer between Jewish and non-Jewish women is in fact attributable solely to lack of circumcision in the latter group, the non-Jewish women with circumcised husbands should have as low an incidence as do Jewish women. Conversely, if early marriage is indeed an important etiological factor, then groups with a high incidence, such as Negroes, should

have a high degree of early marriage. The present study was thus conceived as an attempt to determine by personal interview: (a) whether factors that could explain variations in the incidence of cervical cancer among the different population groups could also explain variations within each group, and (b) whether factors that explained variations within different population groups could also explain variations between them. Consequently, parallel studies among non-Jewish white women and Negro women were undertaken to determine whether the frequency of such factors as circumcision and early onset of first coitus varied between the cervix cancer and control groups separately for each population. In addition, studies of Jewish and Indian women were undertaken to see if the characteristics that occurred with greater frequency among the Indian women occurred with less frequency among Jewish women.

Other suspected etiological factors, such as genetic constitution and cervical lacerations, are not well suited to study by interview, and we were not able to explore them.

In view of the importance of economic level, which is, of course, an index to etiological factors rather than an etiological factor in itself, it seemed essential to draw controls from the same economic level as the cervical cancer cases. For this reason, we confined ourselves almost entirely to clinic populations, in which at least a rough equality in economic and social status may be assumed.

TABLE IV. NUMBER OF PATIENTS WITH CANCER OF THE CERVIX AND CONTROLS BY AGE AND HOSPITAL OF INTERVIEW, WHITE NON-JEWISH, JEWISH, AND NEGRO

	WHITE					
	NON-JEWISH		JEWISH		NEGRO	
HOSPITAL	CERVIX	CONTROL	CERVIX	CONTROL	CERVIX	CONTROL
New York. —						
Memorial Gyn. Clinic	129	302	7	264	56	95
Memorial Hospital Wards	12	4	8	7	3	2
James Ewing	16	45	1	32	8	14
Bellevue Radiologic Clinic	26	41	1	13	13	12
Harlem Hospital	1	0	0	0	20	52
Jersey City.—						
Margaret Hague Med. Center	28	86	1	1	9	42
Philadelphia.—						
Univ. of Pennsylvania Hospital	33	31	1	6	45	66
Washington.—						
Georgetown	11	13	0	3	6	32
Walter Reed	28	9	0	0	3	2
Gallinger	3	1	0	0	16	39
Warwick Clinic of George Washington Hospital	15	2	0	0	19	11
St. Louis.—						
Barnes	24	28	1	0	9	15
Barnard	28	32	0	0	8	9
Total	354	594	20	326	215	391
AGE AT INTERVIEW						
Less than 30 years	14	54	0	13	10	59
30-39	60	107	7	52	58	137
40-49	110	184	4	131	68	117
50-59	110	154	6	101	51	51
60 and over	60	95	3	29	28	27
Total	354	594	20	326	215	391

Hospitals.—This study was a cooperative investigation, involving interviews at 12 different hospitals in the United States. The distribution of the cases interviewed by hospital and age is shown in Table IV.

Case Material.—The control group was interviewed on gynecologic services. A breakdown of the various gynecologic conditions found among the controls is shown in Table V. It will be noted that chronic cervicitis and polyps of the cervix were seen as frequently in the Jewish patients as in the white non-Jewish or the Negro patients.

TABLE V. NUMBER OF CONTROL PATIENTS, BY DIAGNOSIS: WHITE NON-JEWISH, JEWISH, AND NEGRO, MEMORIAL CLINIC AND ALL HOSPITALS COMBINED

CONDITION	MEMORIAL CLINIC			ALL HOSPITALS		
	WHITE			WHITE		
	NON-JEWISH	JEWISH	NEGRO	NON-JEWISH	JEWISH	NEGRO
Uterus, malignant	31	12	8	71	21	37
Uterus, benign	44	49	21	87	60	152
Cervicitis, chronic	71	60	26	111	63	43
Polyp of cervix	20	26	5	31	28	16
Carcinoma of ovary	13	2	4	26	4	17
Carcinoma of vulva	9	7	1	13	9	3
Malignant, misc.	7	14	5	25	17	15
Benign, misc.	69	59	17	120	64	73
No positive gyn. lesions	38	35	8	110	60	35
Total	302	264	95	594	326	391

In addition to the control and cervix cases shown in Tables IV and V, the following additional patients with cervical cancer were interviewed, but are not included in any of the analyses which follow:

	WHITE		NEGRO
	NON-JEWISH	JEWISH	
Adenocarcinoma	14	4	15
Carcinoma in situ	18	3	13

The Interview.—Regeena Goodwyn and Florence Moreno interviewed all patients at the Memorial Clinic and Memorial Wards,* and in Jersey City and Philadelphia. Dr. Charles Miller interviewed all the St. Louis patients. The patients seen in Washington, D. C., were interviewed by Drs. F. Ablondi, Tom Higgins, Mary Kiernan, James Leonard, Marion MacLean, and Ernest Wynder.

The interview approach was the same for all patients, since all had gynecologic complaints. The patient was told that this interview was necessary to complete her history and would assist in evaluating her particular problem. It was stressed that all of the questions had to be answered correctly, although some might seem personal, because they might be related to the development of her disease. The patient was assured that her replies would be kept absolutely confidential.

Special care was taken to assure accuracy in the question regarding circumcision. It was recognized that some women regard a loose and short foreskin as circumcision. The interviewers were therefore instructed not to accept a simple "yes" or "no" answer, but to probe for evidence of definite information. When such information was absent, the woman was asked to question her husband and then to give us her reply. If this was not possible, or the information was still inconclusive, the answer was left as "Don't Know." Identical procedures were followed for cervix and control cases.

*Some of the Jewish patients with cervical cancer seen on the Memorial Wards were interviewed by Miss E. Schwab and by E. L. Wynder.

After the interview was completed, the charts were reviewed for definitive diagnosis. In many of the cases the diagnosis was not available at that particular time and had to be added later. In all cases of cervical cancer, biopsy report was available.

Blind Interviewing.—At the Memorial Gynecological Clinic the patients to be interviewed were selected on each clinic day from the clinic list of those present. The list gave no clue as to the patient's condition. The interviewing at the Memorial Clinic was thus completely blind. At other hospitals, however, it was not always possible to assure such automatic control on the objectivity of the interviewer. For this reason, the data obtained at the Memorial Clinic have been analyzed separately.

Age-Hospital Standardization.—The distributions of cervical cancer and control patients by age at interview are not the same. Thus, only 2 out of 129 white non-Jewish cervix patients at Memorial Clinic were less than 30 years of age, while a considerably larger proportion of the controls—22 out of 302—were this young. Similarly, the distributions by hospital of interview were not the same. For example, one-third of the non-Jewish cervix cases studied were seen at the Memorial Clinic and one-half of the controls. To eliminate the effects of these differences in age and hospital distribution on the comparisons between cervix and control patients, we have uniformly adjusted the results for the control patients to the age-hospital distribution of the cervix cases.

TABLE VI. PER CENT DISTRIBUTION OF CERVICAL CANCER AND CONTROL PATIENTS BY MARITAL STATUS, WHITE NON-JEWISH, JEWISH, AND NEGRO

MARITAL STATUS AT TIME OF INTERVIEW	WHITE			NEGRO	
	NON-JEWISH		JEWISH		
	CERVIX	CONTROL	CONTROL	CERVIX	CONTROL
Memorial Clinic.—					
Married	59	67	71	31	36
Never married	2	9	4	2	9
Divorced and separated	12	8	8	38	28
Widowed	27	16	17	29	27
Total	100	100	100	100	100
All Hospitals Combined.—					
Married	62	65		40	43
Never married	2	9		4	10
Divorced	14	11		33	27
Widowed	22	15		23	20
Total	100	100		100	100

The procedure used was designed to give each age-hospital group in the controls the same relative weight that it had in the cervix group. Thus if proportion w_i of all cervix cases fell in the i^{th} age-hospital group and if proportion p_i of the control cases in this age-hospital group have some characteristic, i.e., being married, the age-hospital standardized estimate of the proportion married is $\Sigma w_i p_i$, the summation extending over all age-hospital groups. Routinely this adjustment was performed by assigning a multiplier to each age-hospital group in the controls and entering this multiplier on the punch card for each individual in that group. If w_i denotes the number of cases among the controls in the i^{th} age-hospital group, the multiplier for this group was w_i/n_i. The age-hospital standardized estimate of the proportion of the controls having a certain characteristic, i.e., being married, is then obtained

by (a) sorting out the cards for all control patients who were married, (b) obtaining on a tabulator the sum of the multipliers for all married controls. The 594 controls, age-hospital adjusted on this basis, give results of less precision, however, than would have been obtained with 594 controls matched on an age-hospital basis to the cervix patients. The 594 adjusted controls gave results of equivalent precision to what would have been obtained with 330 matched controls. For this reason, we have taken the control total as 330 and have referred to the number of cases resulting from this procedure in the various tables as the equivalent number of cases after age-hospital standardization.

The Negro controls were adjusted to the age-hospital distribution of the Negro cervix cancer cases. The 391 controls interviewed and adjusted were equivalent in precision to 287 matched and unadjusted controls. The white Jewish control cases were not adjusted to the white Jewish cervix group, which is too small to justify statistical analysis, but rather to the white non-Jewish cervix group. For the Indian data, the results were age-adjusted in the same fashion.

At some points in the following analysis we found it necessary to standardize out other factors, such as age at first marriage. The procedure employed in these cases is identical with that used for the age-hospital standardization.

Results (American)

In the following group of tables we compare the percentage distribution of patients with cancer of the cervix and controls separately for the white non-Jewish and Negro groups.

Results are shown separately for Memorial Clinic and for all hospitals combined for the one-way classifications. Memorial accounts for roughly one-third of all cases in all hospitals combined in both cervical cancer and control groups, both for the white non-Jewish and Negro groups after age-hospital standardization. For cross-classifications we show results only for all hospitals combined. All results are presented on an age-hospital standardized basis.

Comparable data are also shown for Jewish controls at Memorial Clinic, but discussion of these results is reserved for page 1036. It would be misleading to present percentage distributions for the 20 Jewish cervical cancer cases. These cases are presented in Table XX.

Marital Status.—There is a consistently smaller proportion of single women in the cervical cancer group as compared with the control group, both for whites and Negroes, in Memorial and all hospitals (Table VI). There is also a consistently higher proportion of divorced and separated women in the cervical cancer group. There is a higher proportion of widows in the cervical cancer group among the whites, but not among the Negroes.

Number of Marriages.—There is a consistently larger proportion of women who have been married two or more times in the cervical cancer group (Table VII). In the white non-Jewish Memorial group, 29 per cent of those with cancer of the cervix who had ever been married had been married twice or more. Among the controls the comparable figure is 12 per cent, or less than half. For all hospitals combined the results are almost identical. In the Negro group in Memorial Clinic, multiple marriages had occurred among 35 per cent of the ever-married cervix group, but among only 22 per cent of the controls who had ever been married.

To what extent is this difference in the frequency of multiple marriages a consequence of the difference in marital status shown in Table VI? In Table VIII we show the frequency of multiple marriages separately for women

who were married, divorced, or separated, or widowed at the time of interview. The differences persist for all three groups. There is a suggestion in the data that there is less difference in the frequency of multiple marriages between widowed cervical cancer patients and controls than for the other two groups. This difference is not statistically significant, however. We conclude that the difference in the frequency of multiple marriages between cervical cancer and control groups does not arise because of differences in marital status.

TABLE VII. PER CENT DISTRIBUTION OF CERVICAL CANCER AND CONTROL PATIENTS WHO HAD EVER BEEN MARRIED, BY NUMBER OF MARRIAGES, WHITE, NON-JEWISH, JEWISH, AND NEGRO

NUMBER OF MARRIAGES	WHITE			NEGRO	
	NON-JEWISH		JEWISH		
	CERVIX	CONTROL	CONTROL	CERVIX	CONTROL
Memorial Clinic.—					
1	71	88	89	65	78
2	28	11	11	31	18
3 or more	1	1	0	4	4
Total	100	100	100	100	100
All Hospitals Combined.—					
1	70	86		65	78
2	28	12		30	20
3 or more	2	2		5	2
Total	100	100		100	100

TABLE VIII. PER CENT OF CERVICAL CANCER AND CONTROL PATIENTS WHO HAD EVER BEEN MARRIED, MARRIED TWO OR MORE TIMES, BY MARITAL STATUS, WHITE, NON-JEWISH, AND NEGRO, ALL HOSPITALS COMBINED

MARITAL STATUS AT TIME OF INTERVIEW	WHITE, NON-JEWISH				NEGRO			
	NUMBER OF CASES		PER CENT MARRIED TWO OR MORE TIMES		NUMBER OF CASES		PER CENT MARRIED TWO OR MORE TIMES	
	CERVIX	CONTROL*	CERVIX	CONTROL	CERVIX	CONTROL*	CERVIX	CONTROL
Married	220	219	33	14	86	125	47	26
Divorced or separated	49	34	37	11	71	75	21	16
Widowed	76	49	19	16	49	59	35	19
Total	345	302	30	14	206	259	35	22

*Equivalent number of cases after age-hospital standardization.

Age at First Marriage and First Coitus.—The cervix patients, both white and Negro, at Memorial Clinic and all hospitals, show a markedly earlier age of marriage than do the control patients (Table IX). Thus, 13 per cent of the Memorial white non-Jewish cervical cancer group were married by age 16, as compared with 5 per cent of the comparable controls. For Memorial Negroes, 32 per cent of the cervical cancer group was married by age 16, and 13 per cent of the controls. The differences for all hospitals combined are slightly smaller, but still pronounced.

No matter what the etiological significance of this difference, it is clear that age at first coitus may be a more crucial variable than age of first marriage, albeit one which may not be reported so accurately. It will be seen (Table X) that the differences between cervical cancer and control groups in age at first coitus are somewhat larger than in age at first marriage. For Memorial white non-Jewish, the comparative percentages for first coitus by age 16, are 17 for cervical cancer and 6 for control, as compared with 13 and

5 for first marriage by this age. Similarly, for age 25, the comparative percentages for first coitus by this age are 12 for cervical cancer and 26 for controls, as compared with 18 and 31 for first marriages by this age. It is also of interest to note that for both whites and Negroes 1 per cent of all cervical cancer patients reported never having had coitus. Seven per cent of the white controls and 2 per cent of the Negro controls reported no such relations.

TABLE IX. PER CENT DISTRIBUTION OF CERVICAL CANCER AND CONTROL PATIENTS WHO HAD EVER BEEN MARRIED BY AGE AT FIRST MARRIAGE, WHITE NON-JEWISH, JEWISH, AND NEGRO

	WHITE			NEGRO	
	NON-JEWISH		JEWISH		
AGE AT FIRST MARRIAGE	CERVIX	CONTROL	CONTROL	CERVIX	CONTROL
Memorial Clinic. —					
16 or less	13	5	4	32	13
17-19	38	26	15	39	38
20-24	31	38	46	19	25
25 or more	18	31	35	10	24
Total	100	100	100	100	100
All Hospitals Combined.—					
16 or less	14	8		32	19
17-19	40	25		36	34
20-24	29	39		21	29
25 or more	17	28		11	18
Total	100	100		100	100

TABLE X. PER CENT DISTRIBUTION OF CERVICAL CANCER AND CONTROL PATIENTS BY AGE AT FIRST COITUS, WHITE NON-JEWISH, JEWISH, AND NEGRO

	WHITE			NEGRO	
	NON-JEWISH		JEWISH		
AGE AT FIRST COITUS	CERVIX	CONTROL	CONTROL	CERVIX	CONTROL
Memorial Clinic.—					
16 or less	17	6	4	45	28
17-19	38	27	15	41	44
20-24	32	34	43	13	16
25 or more	12	26	34	2	11
Never	1	7	4	0	1
Total	100	100	100	100	100
All Hospitals Combined.—					
16 or less	19	10		55	36
17-19	41	25		30	39
20-24	26	36		12	16
25 or more	12	22		2	7
Never	1	7		1	2
Total	100	100		100	100

To what extent is this difference in age at first coitus simply a consequence of differences in the number of marriages shown in Table VII? In Table XI we have classified cervical cancer and control patients both by age at first coitus and by number of marriages. It is clear from the table that these characteristics are correlated, in the sense that women with early coitus tend to marry more than once. From our present point of view, however, it is more important to note that differences between cervical cancer and control patients, in age at first coitus, persist even when the effect of number of

marriages is eliminated. Thus, for the white non-Jewish group who had been married once, a considerably smaller proportion of the cervical cancer group than of the control group had their first coitus after age 25, 14 per cent for the former and 25 per cent for the latter. Similarly, the differences between the cervix cancer group and control group in number of marriages persists even after the effect of age at first coitus is eliminated. For the white non-Jewish group which had their first sexual intercourse at age 20 to 24, a considerably larger proportion of the cervix than of the control group had been married two or more times, 20 per cent for the former and 8 per cent for the latter.

TABLE XI. NUMBER OF CERVICAL CANCER AND CONTROL PATIENTS BY AGE AT FIRST COITUS AND NUMBER OF MARRIAGES, WHITE NON-JEWISH, AND NEGRO, ALL HOSPITALS COMBINED

AGE AT FIRST COITUS	CERVIX NUMBER OF MARRIAGES				CONTROL* NUMBER OF MARRIAGES			
	TOTAL	0	1	2+	TOTAL	0	1	2+
White Non-Jewish.—								
16 or less	66	1	35	30	34	1	25	8
17-19	143	1	93	49	83	1	60	22
20-24	98	1	77	20	117	1	107	9
25 or more	40	2	32	6	72	4	65	3
Never	3	3	0	0	22	22	0	0
No report	4	0	4	0	2	0	2	0
Total	354	8	241	105	330	29	259	42
Negro.—								
16 or less	119	4	70	45	103	5	71	27
17-19	64	3	42	19	112	9	82	21
20-24	25	1	17	7	48	5	35	8
25 or more	5	0	5	0	20	5	15	0
Never	0	0	0	0	5	5	0	0
No report	2	0	1	1	2	0	2	0
Total	215	8	135	72	290	29	205	56

*Equivalent number of cases after age-hospital standardization.

We show in Table XII the percentage distribution by age at diagnosis of the white and Negro cervical cancer groups. It will be noted that for each group the patients with early coitus have cancer diagnosed at an earlier age. The median age of onset for white cervical cancer patients whose first sex relationship occurred before age 16 is 44; for those whose first coitus did not occur until after age 25, it is 54. For the Negro cervix patients much the same trend is evident, although the concentration of cases with early coitus makes the trend somewhat erratic and more doubtful. A roughly similar trend, however, is also found for the controls.

Number of Pregnancies.—There is a small but consistent difference between the ever-married cervical cancer patients and control patients in the proportion who have never been pregnant. In the white group, both at Memorial and in all hospitals, 9 per cent of the cervical cancer group had never been pregnant, as compared with 12 per cent in the control group (Table XIII). Among the Negroes studied the difference is larger—11 per cent in the cervical cancer group and 17 per cent in the controls at Memorial and 11 and 18 per cent in all hospitals. When the effect of number of pregnancies among those women who have ever been pregnant is considered, an additional difference appears between the two groups for the whites but not for the Negroes. Seventeen per cent of the patients who had ever been

TABLE XII. PER CENT DISTRIBUTION OF CERVICAL CANCER AND CONTROL PATIENTS BY AGE AT DIAGNOSIS, AGE AT FIRST COITUS, WHITE NON-JEWISH, AND NEGRO AT ALL HOSPITALS COMBINED

AGE AT DIAGNOSIS	CERVIX AGE AT FIRST COITUS					CONTROL AGE AT FIRST COITUS				
	16 OR LESS	17-19	20-24	25+	NEVER*	16 OR LESS	17-19	20-24	25+	NEVER*
White, Non-Jewish.—										
30 or less	7	3	2	3	(0)	2	2	6	3	(6)
31-40	30	15	14	12	(0)	34	21	19	6	(11)
41-50	30	35	29	21	(67)	18	34	37	30	(23)
51-60	19	28	40	38	(0)	38	24	26	41	(20)
61+	13	18	15	26	(33)	8	19	12	20	(41)
Total	100	100	100	100	100	100	100	100	100	100
Median age	44	49	51	54	(47)	48	48	47	54	(56)
Negro.—										
30 or less	6	5	(0)	(0)	—	5	5	4	(0)	(3)
31-40	31	18	(27)	(20)	—	34	22	28	(16)	(10)
41-50	28	37	(42)	(20)	—	29	40	24	(26)	(26)
51-60	25	25	(19)	(20)	—	24	22	27	(39)	(0)
61+	10	15	(12)	(40)	—	8	11	17	(19)	(61)
Total	100	100	100	100	—	100	100	100	100	100
Median age	45	47	(45)	(55)		45	47	48	(53)	(51)

*Per cent distributions based on fewer than 30 cases are shown in parentheses.

TABLE XIII. PER CENT DISTRIBUTION OF CERVICAL CANCER AND CONTROL PATIENTS WHO HAVE EVER BEEN MARRIED BY NUMBER OF PREGNANCIES, WHITE NON-JEWISH, JEWISH, AND NEGRO

NUMBER OF PREGNANCIES	WHITE			NEGRO	
	NON-JEWISH		JEWISH		
	CERVIX	CONTROL	CONTROL	CERVIX	CONTROL
Memorial Clinic.—					
0	9	12	11	11	17
1 or more	91	88	89	89	83
Total	100	100	100	100	100
Pregnant.—					
1-2 times	35	41	42	50	38
3-4	32	29	38	18	28
5-6	16	19	13	14	19
7-8	10	7	4	14	6
9 or more	7	4	3	4	9
Total	100	100	100	100	100
All Hospitals Combined.—					
0	9	12		11	18
1 or more	91	88		89	82
Total	100	100		100	100
Pregnant.—					
1-2 times	37	44		46	46
3-4	27	29		25	25
5-6	16	16		14	16
7-8	10	6		8	5
9 or more	10	5		7	8
Total	100	100		100	100

pregnant in the white cervical cancer group at Memorial reported 7 or more pregnancies, as compared with 11 per cent in the controls. For all hospitals combined, the proportion with 7 or more pregnancies is 20 in the cervix group and 11 in the controls.

One would, of course, suspect some relation between age at first marriage and number of pregnancies, and it is of some importance to know the extent to which each of these characteristics is independently associated with the development of cervical cancer. In Table XIV we have classified cervical cancer and control patients simultaneously by number of pregnancies and age at first marriage. It is clear from this tabulation that these two factors are closely associated. Of the 49 white cervical cancer patients who had been married by age 16, only one had never been pregnant. Of the 58 who were not married until after age 25, 13 had never been pregnant. This association holds for both cervical cancer and control patients, white and Negro.

TABLE XIV. NUMBER OF CERVICAL CANCER CONTROL PATIENTS WHO HAD EVER BEEN MARRIED BY NUMBER OF PREGNANCIES AND AGE AT FIRST MARRIAGE, WHITE NON-JEWISH, AND NEGRO, ALL HOSPITALS COMBINED

NUMBER OF PREGNANCIES	CERVIX AGE AT FIRST MARRIAGE					CONTROL* AGE AT FIRST MARRIAGE				
	TOTAL	16 OR LESS	17-19	20-24	25 OR MORE	TOTAL	16 OR LESS	17-19	20-24	25 OR MORE
White, Non-Jewish.—										
0	30	1	7	9	13	37	1	3	8	25
1-2	116	13	37	38	28	114	3	22	50	39
3-4	87	12	39	27	9	78	6	23	35	14
5-6	53	10	28	10	5	41	5	14	17	5
7-8	30	7	8	13	2	17	4	8	4	1
9 or more	30	6	19	4	1	14	4	6	3	1
Total	346	49	138	101	58	301	23	76	117	85
Negro.—										
0	23	2	5	7	9	46	4	9	14	19
1-2	84	24	27	22	11	97	16	30	32	19
3-4	45	18	21	4	2	53	13	22	11	7
5-6	25	11	8	6	0	34	7	11	14	2
7-8	14	7	6	1	0	12	5	5	2	0
9 or more	14	4	7	3	0	17	5	10	2	0
Total	205	66	74	43	22	259	50	87	75	47

*Equivalent number of cases after age-hospital standardization.

Do both factors exert independent effects, despite this association, as in the cases of age at first sexual intercourse and number of marriages (Table XI), or is only one of the factors truly independent? It is clear from inspection that even when the effect of number of pregnancies is held constant, cervix and control groups still differ in age at first marriage. Somewhat more than 10 per cent of all white cervical patients who had been pregnant only once or twice were married by age 16, as compared with less than 3 per cent among the controls. It is far from clear, however, when age at first marriage is held constant, that any difference remains in the frequency of pregnancies in the two groups. Thus, of the white cervical cancer patients who were married at age 17 to 19, 7 out of 138 had never been pregnant. Three out of 76—or 4 per cent—of the white control patients who were married at this age had never been pregnant. There appears to be no difference in pregnancy history when the comparison is confined to women who were married at the same age. To make certain that the impressions suggested by inspection are not misleading,

we have in Table XV standardized out the effect of age of marriage in the same way that the effects of age and hospital (page 1023) were eliminated. The distributions of cervix and control groups by number of pregnancies shown in this table are essentially the same.

TABLE XV. PER CENT DISTRIBUTION OF CERVIX AND AGE AT FIRST MARRIAGE STANDARDIZED* CONTROL PATIENTS BY NUMBER OF PREGNANCIES, WHITE NON-JEWISH AND NEGRO, ALL HOSPITALS COMBINED

NUMBER OF PREGNANCIES	WHITE NON-JEWISH		NEGRO	
	CERVIX	CONTROL	CERVIX	CONTROL
0	9	9	11	15
1-2	33	33	41	36
3-4	25	28	22	22
5-6	15	16	12	13
7-8	9	8	7	6
9 or more	9	6	7	8
Total	100	100	100	100

*Obtained from Table XIV by weighting the per cent distribution by number of pregnancies for each age-at-first-marriage class in the control group by the number of cases in that class in the group with cancer of the cervix.

We conclude that these data provide no evidence of an association between the fact of pregnancy or of number of pregnancies and the development of cervical cancer. One will, of course, see fewer women who have never been pregnant in a cervical cancer group, but this occurs apparently because one will see fewer single women in such a group. Also, one will see somewhat more women with many pregnancies in a cervical cancer group, but only because this group contains more women who married early.

Age at First and Last Pregnancy.—When cervix and control patients are compared with respect to age at first pregnancy and age at last pregnancy, marked differences appear, both in the white non-Jewish, and in the Negro groups. Only 18 per cent of the white non-Jewish cervix patients, but 34 per cent of the controls had their first pregnancy at or after age 25 (Table XVI). Similarly, 32 per cent of the white non-Jewish cervix patients, but only 25 per cent of the controls, had their last pregnancy at or before age 25.

One would, of course, expect age at both first and last pregnancies to depend on age at marriage. When the control groups are made comparable to the cervix patients in this respect, by standardizing with respect to age at first marriage, it will be noted that the differences are essentially eliminated. Therefore, the differences in age at first and last pregnancies do not appear to be independent variables, but merely reflect previous differences in age at marriage.

Miscarriages and Abortions.—We have also investigated the distributions of the populations studied by number of miscarriages and abortions. No marked or consistent differences are apparent. This body of data has thus yielded no evidence that there are any differences between cervical cancer and control populations, in any characteristics associated with pregnancy, whether it be the number of such pregnancies, the age at which they occurred, or associated phenomena, such as abortions and miscarriages.

Syphilis.—Previous studies have reported twice as many syphilitic patients among women with cervical cancer as in the general population.[50-52] We found a similar difference between our cervical cancer non-Jewish white patients and the controls. Essentially no difference was found, however, between the Negro cervical cancer and control patients. (Forty-one out of 215 of the former and 46 out of 290 of the latter reported a past history of syphilis.)

In view of the general unreliability of syphilis information obtained solely from personal interview, no great weight can be attached to our results. Of interest, however, is the fact that those reporting a past history of syphilis also reported, as one might expect, earlier age at first coitus. In fact, the relation between age at first coitus and prevalence of syphilis as reported is such as to lead one to expect a twofold difference between cervix and control patients solely because of their difference in age at first coitus. This result, although fragmentary, is consistent with Levin's[50] and Wallingford's[53] observation that the statistical association between syphilis and cervical cancer could arise from the greater frequency of coitus in the former group.

TABLE XVI. PER CENT DISTRIBUTION OF CERVIX AND CONTROL PATIENTS WHO HAD EVER BEEN PREGNANT BY AGE AT FIRST PREGNANCY AND AGE AT LAST PREGNANCY, WHITE NON-JEWISH, AND NEGRO, ALL HOSPITALS COMBINED

AGE AT PREGNANCY	WHITE NON-JEWISH CONTROL			NEGRO CONTROL		
	CERVIX	CRUDE*	STANDARDIZED†	CERVIX	CRUDE*	STANDARDIZED†
First.—						
16 or less	9	3	6	31	18	26
17-19	36	23	36	34	32	33
20-24	37	40	36	24	31	25
25 or more	18	34	22	11	19	16
Total	100	100	100	100	100	100
Last.—						
20 or less	12	7	10	30	20	23
21-25	20	18	18	27	24	24
26-30	26	25	25	17	24	21
31-35	25	24	24	14	15	15
36 or more	17	26	23	12	17	17
Total	100	100	100	100	100	100

*Standardized for age and hospital of interview, but not age at first marriage.
†Standardized for age at first marriage in addition.

Circumcision Status of Partners.—We present in Table XVII the distribution of cervix and control patients by circumcision status of partner. It will be noted that women with circumcised husbands and no other partners are found less frequently in the cervix than the control groups. Thus, in the white non-Jewish groups at Memorial, 3 per cent of the cervix patients, but 9 per cent of the controls had relations with circumcised husbands only. At all other hospitals combined the comparable figures are 5 per cent for the cervix groups and 14 for the controls. For the Negro patients the differences are even larger—0 per cent and 9 per cent at all hospitals.

There is an additional group of women with circumcised husbands who have had relations with other partners. In most such cases the circumcision status of the additional male partner is unknown to the patient, although in view of the relatively low frequency of circumcision in the groups studied, it must be presumed that the bulk of these contacts involved at least one uncircumcised partner, particularly when there was more than one extramarital partner. Of the women with circumcised husbands, a considerably larger proportion in the cervix than in the control group reported additional exposures. The extent of this additional exposure is unknown to us. If it were infrequent, then presumably this group must also be treated as effectively exposed only to circumcised males. If it were extensive and involved many partners, it would be unrealistic to treat them in this way. In the absence of such knowledge,

we can only say that between 5 and 8 per cent of the white non-Jewish cervical cancer group were effectively exposed only to circumcised males, while the comparable figures for controls were between 14 and 18 per cent. For Negro women the comparable figures are 0 to 7 per cent for the cervical cancer group and 9 to 18 per cent for the controls. The indeterminateness introduced by this group is not a doubt as to whether circumcision makes a difference, but how big the difference is.*

TABLE XVII. PER CENT DISTRIBUTION OF CERVIX AND CONTROL PATIENTS WITH SEXUAL EXPERIENCE BY CIRCUMCISION STATUS OF PARTNERS, WHITE NON-JEWISH, AND NEGRO

CIRCUMCISION STATUS OF PARTNERS	WHITE			NEGRO	
	NON-JEWISH		JEWISH		
	CERVIX	CONTROLS	CONTROLS	CERVIX	CONTROLS
Memorial Clinic.—					
Circumcised husbands only:					
No other partners	3	9	93	0	8
Pre-, extra-, or postmarital partners	3	3	2	8	5
Circumcised and uncircumcised husbands	4	3	1	2	5
Uncircumcised husbands only	80	75	1	65	47
Circumcision status unknown	10	10	3	25	35
Total	100	100	100	100	100
All Hospitals Combined.—					
Circumcised husbands only:					
No other partners	5	14		< 1*	9
Pre-, extra-, or postmarital partners	3	4		7	9
Circumcised and uncircumcised husbands	6	3		5	4
Uncircumcised husbands only	75	69		66	49
Circumcision status unknown	11	10		22	29
Total	100	100		100	100

*Less than 0.5 per cent (1 case out of 215).

A considerable number of patients could not tell us the circumcision status of their partners. In many cases we were able to obtain this information from the partner himself, but even this was ineffective when the patient was widowed, divorced, or remarried. In consequence, 10 per cent of the white non-Jewish patients and 20 to 30 per cent of the Negro patients were unable to report on circumcision status of partners. For patients who had been married only once, the proportion unknown was smaller, but still far from trivial—8 per cent for the white and 20 per cent for the Negroes. By making sufficiently unfavorable assumptions about the circumcision status of the unknowns, one could wipe out the difference in circumcision status between cervical cancer and control groups.

We have attempted to check on the circumcision results shown in Table XVII by using a different method of collecting the information—direct interviews with males in the wards of some of the hospitals where females were studied. Out of 489 white males, 80, or 16 per cent, were circumcised; 37 out of 208, or 18 per cent, of the Negro males were circumcised. These percentages agree with those reported by females. They also confirm the fact that in the

*This indeterminateness could have been avoided by obtaining information on pre-, extra-, or postmarital partners for women with uncircumcised husbands. At the time the survey was being planned, we were unwilling to ask such questions of more than the circumcised groups, for whom it was obviously necessary. We did not, of course, foresee the present difficulty

ward and clinic population circumcision is equally common among whites and Negroes. This result is explained at least in part by the following facts: (1) at least twice as many native-born white males are circumcised as foreign-born males; Negro males are predominantly native-born, and (2) many Negroes are circumcised in their teens.

We show in Table XVIII the simultaneous distribution of cervical cancer and control cases by circumcision status of partner and number of times married. For those married once, 10 per cent of the cervix groups and approximately 20 per cent of the controls reported a circumcised husband. This was true for both the white non-Jewish and Negro groups. For those married twice, the proportion with both husbands circumcised is, of course, smaller, but the difference between cervix and control groups is in the same direction and of approximately the same magnitude for both white non-Jewish and Negro groups, although only for the former groups is the difference statistically significant.

TABLE XVIII. NUMBER OF CERVICAL CANCER AND CONTROL PATIENTS WITH SEXUAL EXPERIENCE BY CIRCUMCISION STATUS OF PARTNERS AND NUMBER OF MARRIAGES, WHITE NON-JEWISH, AND NEGRO, ALL HOSPITALS COMBINED

CIRCUMCISION STATUS OF PARTNERS	CERVIX NO. OF MARRIAGES			CONTROLS* NO. OF MARRIAGES		
	0	1	2+	0	1	2+
White Non-Jewish.—						
Circumcised husbands only:						
No other partners	0	15	1	0	42	2
Pre-, extra-, or postmarital partners	0	9	2	0	10	4
Circumcised and uncircumcised husbands	0	0	21	0	0	8
Uncircumcised husbands only	0	197	67	0	188	26
Circumcision status unknown	5	20	14	6	21	2
Total	5	241	105	6	261	42
Negro.—						
Circumcised husbands only:						
No other partners	0	1	0	0	23	3
Pre-, extra-, or postmarital partners	0	12	3	0	22	4
Circumcised and uncircumcised husbands	0	0	10	0	0	10
Uncircumcised husbands only	0	96	45	1	113	25
Circumcision status unknown	8	26	14	23	46	13
Total	8	135	72	24	204	55

*Equivalent number of cases after age-hospital standardization.

In Table XIX we show the simultaneous distribution of cervix and control cases by circumcision status of partner and age at first coitus for those married only once. This table shows that differences in frequency of circumcision between cervical cancer and control groups persist for both white non-Jewish and Negro groups, even after the effect of age at first sexual intercourse is held constant. There is also a suggestion that circumcised husbands are reported more frequently by those reporting late first coitus, although the effect is not large and cannot in any event account for the differences in circumcision status.

Menses.—Age of onset of menses was the same in both cervix and control groups, both for whites and Negroes at Memorial and at all hospitals combined. In all cases the median age was 13 to 14. Comparison of length of flow showed also no essential differences between the two groups.

Abstinence After Menses.—About half the white non-Jewish and Negro patients reported some abstention after menses, both in the cervix and control groups. Of those who said they abstained, about 40 per cent reported one or two days as the usual period of abstinence, but again this percentage was the same in cervix and control groups for both white non-Jewish and Negro patients. Of those abstaining in the white non-Jewish group, 16 per cent of the controls and 11 per cent of the cervix group reported abstention for 7 or more days. Among the Negroes the comparable figures were 5 and 6 per cent. Thus, there seems to be no difference in the practice of abstinence between cervix and control groups.

TABLE XIX. NUMBER OF CERVICAL CANCER AND CONTROL PATIENTS WHO MARRIED ONCE BY CIRCUMCISION STATUS OF PARTNERS AND AGE AT FIRST COITUS, WHITE NON-JEWISH, AND NEGRO, FOR ALL HOSPITALS COMBINED

CIRCUMCISION STATUS OF PARTNERS	CERVIX AGE AT FIRST COITUS				CONTROLS* AGE AT FIRST COITUS			
	16 OR LESS	17-19	20-24	25 +	16 OR LESS	17-19	20-24	25 +
White Non-Jewish.—								
Circumcised husbands only:								
No other partners	0	6	6	3	2	6	17	16
Pre-, extra-, or postmarital partners	2	4	1	2	2	1	2	5
Uncircumcised husbands only	30	76	64	24	20	48	80	39
Circumcision status unknown	3	7	6	3	2	4	10	6
Total	35	93	77	32	26	59	109	66
Negro.—								
Circumcised husbands only:								
No other partners	1	0	0	0	4	9	6	4
Pre-, extra-, or postmarital partners	5	6	1	0	12	6	3	1
Uncircumcised husbands only	48	31	12	4	42	44	20	5
Circumcision status unknown	16	5	4	1	14	22	4	5
Total	70	42	17	5	72	81	33	15

*Equivalent number of cases after age-hospital standardization.

Only 30 per cent of the Jewish controls reported no abstention, while of those abstaining, 40 per cent reported abstinence for 7 full days. There was a considerable difference by age groups. Eighty-three per cent of those over 50 reported some abstention, but 62 per cent of those under 50 abstained. Of those over 50 who abstained, 50 per cent reported abstention for 7 full days. For those under 50, the comparable figure was 28 per cent. There is a considerable difference, therefore, in the practice of abstention between the Jewish and non-Jewish population, and an additional difference between younger and older Jewish women. The Jewish women presumably had the Talmudic proscription in mind while answering this question, whereas the non-Jewish women did not. Consequently, the answers may not have the same meanings for both groups. In particular, the Jewish women answering "yes" may have had a more habitual practice in mind than the non-Jewish women. In view of the lack of any reported difference between cervical cancer and control groups, however, it is difficult to draw any firm conclusion with respect to the significance of abstention in the etiology of cervical cancer.

Douching.—No difference was found between cervix and control groups with respect to type or frequency of douching. One-fifth of the white non-Jewish patients in both cervical cancer and control groups reported never

douching. Forty per cent of both groups reported frequent douching. Practices among the Jewish controls were essentially the same. Negro patients, both cervical cancer and controls, reported somewhat more frequent douching than the whites. Specifically, 52 per cent of the controls reported frequent douching, while only 6 per cent said they never douched. In the cervical cancer groups the comparable figures were 50 and 13. Of those that did douche, no differences were apparent between cervix and control groups, either in the frequency of douching, or in the types of douches used. In particular, the use and frequency of use of a brand-name coal-tar derivative was reported with equal frequency by both groups.

Contraception.—No important differences were found between cervical cancer and control groups in contraceptive practice. One-third of the white non-Jewish patients reported no use of contraception, in both cervical cancer and control groups. About 40 per cent of the Negro patients, both cervical cancer and control, reported no use of contraception. A slightly smaller proportion of white non-Jewish cervical cancer patients than of controls reported the use of condoms, both in Memorial and in all hospitals; but no such difference was found among Negro patients. It is to be noted that among those patients who used contraceptives no reliable data were obtained as to the relative frequency with which such contraceptives were used.

Other Factors.—No significant differences were found between cervical cancer and control patients in comparing the history of irritative vaginal discharge, gonorrhea, hormone therapy, method of delivery, or abstinence after parturition.

TABLE XX. TWENTY CASES OF EPIDERMOID CARCINOMA OF THE CERVIX AMONG JEWISH WOMEN, SELECTED CHARACTERISTICS

AGE AT DIAGNOSIS	NUMBER OF MARRIAGES	AGE AT FIRST MARRIAGE	AGE AT FIRST SEXUAL INTERCOURSE	AGE AT FIRST PREGNANCY	NUMBER OF PREGNANCIES	ABSTINENCE AFTER MENSES (DAYS)	CIRCUMCISION CODE*
53	1	22	22	23	3	0	1
61	1	19	19	20	3	0	1
67	1	20	20	21	7	7	1
59	1	24	24	26	2	4	1
54	1	24	24	—	0	3	1
43	1	21	21	21	1	5	1
52	1	19	19	19	2	0	1
46	1	24	24	25	4	7	1
50	1	27	27	—	–	7	1
46	1	24	24	25	3	7	1
58	1	25	25	26	3	7	1
39	2	25	15	33	1	0	2
32	1	23	18	24	1	0	2
39	1	23	18	24	2	0	2
36	1	18	16	18	3	0	2
45	1	18	18	19	3	0	2
32	1	25	25	25	2	0	2
66	3	16	16	16	2	2	3
36	1	27	19	20	5	3	4
34	2	22	22	24	2	0	4

*Circumcision code:
1. Circumcised husband and no other partners.
2. Circumcised husband, but other partners.
3. Mixed circumcision in husbands.
4. Uncircumcised husbands.

Jewish Women.—We list in Table XX some of the characteristics of the 20 Jewish women with cervical cancer who were seen during the course of

this study. Seventeen were seen at Memorial Hospital; 3 elsewhere. Of the 17 seen at Memorial, 7 cases were found during the course of blind interviewing at the Gynecological Clinic. During the same period, 264 Jewish controls were interviewed. At this clinic 431 white non-Jewish women were interviewed; 129 of these had cancer of the cervix. These results re-emphasize the relative infrequency of carcinoma of the cervix among the Jewish population. Ten additional Jewish patients with carcinoma of the cervix were interviewed after the bulk of the interviewing had stopped, in the hope of obtaining further data on the characteristics of Jewish women with cervical cancer.

Firm conclusions can scarcely be drawn from 20 cases. Nevertheless, it is of interest to note that of the 20 patients, 9 reported coitus with uncircumcised men, a significantly higher number than would be expected on the basis of the Jewish controls. Of those 9, 6 had circumcised husbands and reported other exposures. Three of the 20 had uncircumcised husbands, however, and this is also significantly above expectation on the basis of the Jewish controls (5 uncircumcised husbands out of 246 married Jewish controls).

It will be noted that the age of onset of cervical cancer of the 11 exposed to circumcised men only is distinctly and significantly higher than that of the 9 with other exposures, but this may simply be due to the earlier age at first coitus of the latter group. All 20 have a somewhat earlier age at first coitus than the comparable controls. No other differences are manifest.

Estimated Relative Risks.—The previous results have considered the extent to which cervix and control patients differ with respect to certain characteristics. It is useful to invert the discussion and to consider the extent to which persons with certain characteristics differ with respect to their incidence of cervical cancer. Rather than asking how much more early coitus occurs in the cervical cancer group, we now ask how much more cervical cancer occurs among those with early coitus.

TABLE XXI. RELATIVE RISK OF DEVELOPING EPIDERMOID CERVICAL CANCER BY NUMBER OF MARRIAGES AND AGE AT FIRST COITUS, WHITE NON-JEWISH, AND NEGRO WOMEN

(Risk for women married once, with first coitus at age 20 to 24 = 1.0)

CATEGORY	WHITE NON-JEWISH	NEGRO
Virgins	0.2	0
Other single	1.0	0.7
Married Once.—		
Age at first coitus:		
16 or less	1.9	2.0
17-19	2.2	1.0
20-24	1.0	1.0
25 or more	0.7	0.7
Married Twice or More.—		
Age at first coitus:		
16 or less	5.3	3.4
17-24	3.1	1.8
25 or more	2.8	–

The assumptions necessary and the methods by which one can invert have been discussed by several authors (Cornfield,[57] Sadowsky and co-workers[58], and Doll and Hill[59]). All that needs repetition here is that even when all necessary assumptions are satisfied, the sampling error of the estimates is large. They are useful in showing the orders of magnitude of differences, not their precise values. In Table XXI we show the relative risk, estimated from

the data in Table XI, as a function of number of marriages and age of first coitus. We have taken as unity the risk of women married once, with first coitus at ages 20 to 24.

On this basis, women married once with coitus at or before 16 have twice the risk, both in the white and Negro populations; those with first coitus after 25, about 30 per cent less. For those who were married twice or more the risks are approximately doubled.

In Table XXII (upper half) we show estimated relative risks, with the risk for women exposed only to uncircumcised males taken as unity. For those married only once, women with circumcised husbands have only 40 per cent the risk of developing cervical cancer of those with uncircumcised husbands, both in the whites and Negroes. For those married twice, this risk is smaller, but not significantly so.

There are too few cases of cervical cancer among Jewish women to permit a similar calculation, but the differences are qualitatively the same.

TABLE XXII. RELATIVE RISK OF DEVELOPING EPIDERMOID CERVICAL CANCER BY CIRCUMCISION STATUS OF PARTNER, WHITE NON-JEWISH AND NEGRO

(Risk for women with uncircumcised husbands = 1.0 separately for those married once and twice or more.)

	WHITE NON-JEWISH	NEGRO
Married Once.—		
Circumcised husband	*0.4*	*0.4*
No other partners	0.3	0.1
Other partners	0.9	0.8
Uncircumcised husband	1.0	1.0
Married Twice or More.—		
Circumcised husband	*0.2*	*0.2*
No other partners	0.2	0.0
Other partners	0.2	0.4
Mixed circumcision	1.0	0.6
Uncircumcised husband	1.0	1.0

Racial Differences.—We consider here the extent to which differences among white non-Jewish, Jewish, and Negro women in the incidence of cervical cancer can be explained by the factors uncovered in the previous discussion: age at first coitus, number of times married, and circumcision status of partner.

The higher rate among Negro women is qualitatively consistent with their earlier age at first coitus and high remarriage rate and the lower rate among Jewish women is qualitatively consistent with their lower exposure to uncircumcised males and later age at first coitus. Quantitative, as well as qualitative, consistency is desirable, however. The incidence of cervical cancer is approximately 50 per cent higher among Negro than among white non-Jewish women. Can a difference of this magnitude be deduced from the relative risks shown in Table XXI and the difference among white non-Jewish and Negro controls in age at first coitus and remarriage rate shown in Table XI? The estimating procedure is shown in detail in Table XXIII. On the basis of these calculations one would expect the incidence of cervical cancer to be about 40 per cent higher among Negro women than among white non-Jewish. This is of the same order of magnitude as the actual difference of 50 to 60 per cent (Table III). We conclude that the differences between white and Negro women in the incidence of cervical cancer are quantitatively and qualitatively consistent with their differences in age at first coitus and remarriage rate.

The differences between Jewish and non-Jewish women in the incidence of cervical cancer are not known with the same precision as those between

TABLE XXIII. ESTIMATED RISK OF DEVELOPING EPIDERMOID CERVICAL CANCER FOR NEGRO WOMEN RELATIVE TO WHITE NON-JEWISH WOMEN ON THE BASIS OF DIFFERENCES IN AGE AT FIRST COITUS AND NUMBER OF MARRIAGES

	PER CENT DISTRIBUTION OF CONTROLS		RELATIVE RISK		ESTIMATED RISK USING WHITE RELATIVE RISKS		ESTIMATED RISK USING NEGRO RELATIVE RISKS	
CATEGORY	WHITE NON-JEWISH (1)	NEGRO (2)	WHITE NON-JEWISH (3)	NEGRO (4)	WHITE (1) × (3)	NEGRO (2) × (3)	WHITE (1) × (4)	NEGRO (2) × (4)
Virgins	6.7	1.7	0.2	0	1.34	0.34	0	0
Other single	2.1	8.3	1.0	0.7	2.10	8.30	1.47	5.81
Married Once.—								
Age at first coitus:								
16 or less	7.6	24.6	1.9	2.0	14.44	46.74	15.20	49.20
17-19	18.3	28.5	2.2	1.0	40.26	60.50	18.30	28.50
20-24	32.7	12.1	1.0	1.0	32.70	12.10	32.70	12.10
25 or more	19.7	5.2	0.7	0.7	13.79	3.64	13.79	3.64
Married Twice or More.—								
Age at first coitus:								
16 or less	2.4	9.4	5.3	3.4	12.72	49.82	8.16	31.96
17-24	9.4	10.1	3.1	1.8	29.14	31.31	16.92	18.08
25 or more	0.9	0	2.8	–	2.52	0	(2.52)	0
Total	99.8	99.9			149.01	212.75	109.06	149.29
				Relative risk	100	143	100	137

Negro and white non-Jewish. The data from Bellevue, Mount Sinai, and Memorial (Table I) suggest that it is one-fifth to one-tenth as high in Jewish women, but a population survey is required to yield a reliable estimate. Because of the basic indeterminateness noted in our circumcision results, we are unable to say whether they are consistent with a difference of this magnitude.

If the appropriate group to use in measuring the relative risk due to lack of circumcision is that with circumcised husbands and no other partners, the relative risks due to lack of circumcision are consistent with a fivefold difference between Jewish and non-Jewish women. If the appropriate group is the entire group with circumcised husbands, without regard to other partners, the relative risk due to lack of circumcision is not consistent with a fivefold difference between the Jewish and non-Jewish population. Although difference in age at first coitus between the Jewish and non-Jewish population could account for part of the unexplained difference, it could not account for all of it.

Results (Indian)

Concurrently with the American data results were obtained at Tata Memorial Hospital in Bombay. All data were obtained by personal interview. Three hundred four cervix cancer cases are histologically proved cases of epidermoid carcinoma. In addition, 7 patients with adenocarcinoma were interviewed (4 Hindus, 2 Christians, and 1 Moslem). Not all the controls were completely interviewed, since some of these were questioned only in respect to age of first marriage, age of first pregnancy, and number of pregnancies (Table XIV). In most instances the interviewer (P. S. Schroff) knew the diagnosis prior to the interview.

The Hindus, Moslems, and Indian Christians come essentially from the same racial stock,[60] whereas the Parsis are of Persian descent.

Age Distribution.—The distribution of the patients studied by age at which they were seen is shown in Table XXV. The cervical cancer patients have a distinctly earlier age of onset than those in the United States. This is scarcely

TABLE XXIV. NUMBER OF CERVIX AND CONTROL CASES BY RELIGIOUS GROUP AT TATA MEMORIAL

GROUPS	CERVIX PATIENTS	CONTROLS	
		COMPLETE	TOTAL
Hindu	255	146	238
Moslem	26	44	135
Indian Christians	22	29	80
Parsis	—	22	72
Jews	1		

TABLE XXV. NUMBER OF CERVIX AND CONTROL PATIENTS BY AGE AT INTERVIEW, BY RELIGIOUS GROUPS, AND BY HOSPITAL, TATA MEMORIAL HOSPITAL

AGE AT INTERVIEW	HINDU		MOSLEM		CHRISTIAN		PARSI	
	CERVIX	CONTROL	CERVIX	CONTROL	CERVIX	CONTROL	CERVIX	CONTROL
30 or less	17	54	5	22	1	12	—	7
31-40	86	66	6	54	3	16	—	16
41-50	97	74	9	42	8	24	—	22
51-60	39	36	3	7	8	18	—	13
61 or more	16	8	3	10	2	10	—	4
Total	255	238	26	135	22	80	—	62

surprising in view of the fact that the Indian population in general is younger than that in the United States, a fact which is reflected in the age distribution of the controls as well. There is a suggestion that the Moslems have an earlier age of onset of cervical cancer and the Christians a later age, but since this is true of the controls as well, no interpretation can be safely drawn. To complete the record for the Parsis, for whom no cervical cancer cases were interviewed, we give the age distribution of 45 cases of cervical cancer in this group, taken from the admission records of the Tata Memorial Hospital (1941-1950), as follows:

30 or less	0
31-40	2
41-50	7
51-60	14
61 or more	22
Total	45

Age at First Marriage and at First Coitus.—First marriage occurs at a much earlier age in India than in the United States. First coitus, which may occur many years after marriage, is also much earlier. Of interest in Table XXVI are the observations that: (1) first coitus and first marriage take place earlier in the Hindu cervical cancer group than in the controls, (2) Hindu and Moslem controls show no important difference in the age at first coitus or age at first marriage, and (3) both Indian Christians and Parsis show a distinctly later age at first marriage and first coitus than the Hindu and Moslem groups.

Number of Pregnancies.—It is noteworthy that the distribution of Hindu cervical cancer and control patients by number of pregnancies is essentially the same (Table XXVII). It is also of interest to observe that the two groups with later age at marriage and first coitus, the Parsis and the Indian Christians, have a smaller number of pregnancies (Table XXVII).

Circumcision.—In India, both Moslems and Jews practice universal circumcision. None of the other groups systematically circumcise their males.

The usual age at circumcision among Moslem males is between 6 and 12. No essential differences in age at circumcision were found between husbands of patients with cancer of the cervix and those of controls. In 11 cases of cancer of the cervix the husbands were examined for completeness of circumcision and the sulcus was found to be free in all cases.

TABLE XXVI. PER CENT DISTRIBUTION OF CERVICAL CANCER AND CONTROL PATIENTS BY AGE AT MARRIAGE AND BY AGE AT FIRST COITUS BY RELIGIOUS GROUPS, TATA MEMORIAL HOSPITAL

	HINDU		MOSLEM		INDIAN CHRISTIAN		PARSIS	
	CERVIX	CONTROL	CERVIX	CONTROL	CERVIX	CONTROL	CERVIX	CONTROL
Age at Marriage.—								
13 or less	67	52	(58)	18	(5)	4		2
14	11	13	(8)	17	(5)	1		2
15	12	12	(0)	22	(13)	5		5
16	3	9	(15)	13	(9)	14		11
17-19	4	9	(15)	20	(32)	37		32
20 plus	3	5	(4)	10	(36)	38		48
Total	100	100	100	100	100	100		100
Age at First Coitus.—								
13 or less	40	23	(39)	13	(5)	0		
14	17	26	(15)	25	(5)	0		
15	20	22	(4)	22	(14)	10		
16	11	12	(19)	14	(10)	5		
17-19	8	12	(15)	15	(33)	55		20
20 plus	4	5	(8)	11	(33)	30		80
Total	100	100	100	100	100	100		100

TABLE XXVII. NUMBER OF PREGNANCIES OF CERVIX AND CONTROL PATIENTS BY RELIGION. THE CONTROLS HAVE BEEN AGE ADJUSTED TO THEIR RESPECTIVE CERVIX GROUPS, TATA MEMORIAL HOSPITAL

NUMBER OF PREGNANCIES	HINDU		MOSLEM		CHRISTIAN		PARSI
	CERVIX	CONTROL	CERVIX	CONTROL	CERVIX	CONTROL	CONTROL
0	3	5	(4)	7	(0)	4	6
1 or more	97	95	(96)	93	(100)	96	94
If patient has ever been pregnant.—							
1-2	16	20	(16)	27	(14)	17	24
3-4	17	19	(21)	18	(23)	31	31
5-6	23	26	(28)	24	(41)	28	18
7-8	22	17	(19)	17	(18)	7	14
9 or more	22	18	(16)	14	(4)	17	13
Total	100	100	100	100	100	100	100

The Tata material contains one case of cancer of the cervix in an Indian Jewish woman whose husband was circumcised at birth. She married at 12 and gave no history of extramarital coitus.

Onset of Menses.—Onset of menses shows no significant difference between cervical cancer and control groups.

Miscellaneous.—Douching was only rarely and sporadically practiced among the women studied. No differences were noted among the cancer and control groups. For a similar reason, contraceptives can be eliminated, since only one woman questioned had used them.

The factor of abstinence during and after menses was also negative, in view of the fact that only an occasional woman did not abstain during menses and only a few abstained after the menstrual period. In this respect, it must be emphasized that, contrary to a previously expressed theory, no abstention was found after menses among 62 Parsi women questioned.

Nearly all women interviewed abstained from coitus from one month to one year after each delivery, a measure employed chiefly as a means of birth control. However, no significant differences were noted in this respect between the cervical cancer and control groups.

Penile Hygiene.—In view of the fact that circumcision showed up as a positive variable in this study, we have done some investigation on the extent of penile hygiene among American and Indian males. If one wanted to study this factor as a direct influence on the development of cervical cancer, it would require a study of the sexual partners of women with cervical cancer. Because of the obvious difficulty of such a study, we have merely sampled the general hospital population, breaking it down into private, clinic, non-Jewish white, Negro, and Jewish patients. In the non-Jewish groups only uncircumcised individuals were considered. The Indian data were broken down into the various religious groups. The Tata material was, in addition, separated into Deccani, Gujrati, and other Hindu, because of the fact that the Deccanis are of lower economic standing than the other two Hindu groups.

Hospital data are to be considered with caution, since many male patients may take a special bath before coming for examination. In general, the American data show a higher percentage of "smegma" formation among the clinic than among private patients. Of some interest was the observation that a rare Jewish patient, though circumcised, showed some evidence of "smegma" (Table XXVIII).

TABLE XXVIII. PER CENT DISTRIBUTION OF "SMEGMA" FORMATION AMONG AMERICAN AND INDIAN MALES

	NUMBER OF CASES	NONE (%)	MODERATE (%)	MARKED (%)
American.—				
Non-Jewish				
White (private)	580	92	7	1
White (clinic)	125	70	24	6
Jewish	980	99.4	0.6	0
Negro (clinic)	100	54	38	8
Indian (Bombay).—				
Hindu (Deccani)	130	56	28	16
Hindu (Gujrati)	90	74	16	10
Hindu (Other)	70	70	29	1
Christian	50	56	30	14
Moslem	130	100	0	0
Parsi	50	94	4	2
Indian (Madras).—				
Hindu (mixed)	61	16	66	18
Christian	48	27	63	10
Moslem	31	58	42 (slight)	0

The Indian data show the greatest extent of poor penile hygiene among the Deccanis, with the lowest extent among the Parsis and Moslems. The Moslem men, of course, are all circumcised. Two of the Moslem males at Tata had incomplete circumcisions, whereas among the group examined at Madras a considerable portion had a small part of foreskin left over the sulcus where slight "smegma" formation was noted.

Penile hygiene seems to be a consequence of economic status, as shown from both the American and Indian data. From these data, it cannot be concluded that poor penile hygiene is of etiological significance in cervical cancer, but in view of the circumcision data, such data are suggestive.

Interpretation of Data

The body of data presented in the previous pages confirms certain statistical associations previously found and suggests others. Statistical associations, of course, do not by themselves necessarily establish the etiological significance of the associated factors. It is pertinent to inquire whether any pattern emerges from the associations found. The major associations which this study suggests or confirms are marital status, age at first marriage, age at first coitus, number of marriages, and circumcision status of the partner.

Circumcision.—The circumcision data that we obtained are not ideal. The ideal would involve direct examination of each sexual partner of an interviewed female, and is scarcely attainable. The blind interviewing technique used at Memorial Clinic does eliminate the possibility of the differences between the cervical cancer and the control groups having arisen from the interviewer's preconception. We have been unable to visualize any other errors in the interview technique that could create an artificial difference. The fact that this difference is found separately for the white non-Jewish and the Negro populations and even in the small sample of Jewish women with cervical cancer, as well as in the Memorial Clinic and all clinics combined, reinforces the results of purely statistical test of significance and indicates that this is not the kind of random difference that sometimes arises in the analysis of small bodies of data. The results are clearly consistent with the known differences in incidence of cervical cancer between Jewish and non-Jewish women and with the apparently large differences in frequency between Moslem and Hindu women.

It does not lie within the realm of this report to speculate on the reasons for circumcision being a positive variable. It should be noted, however, that the data are compatible with previous work on penile cancer, suggesting that a factor present under the male foreskin may be carcinogenic. It is perhaps of more than academic interest to note that many of the same population groups with a high incidence of cervical cancer also have a relatively high incidence of penile cancer. In this respect, our observation that patients of low-income levels have a poorer penile hygiene than those of high-income groups may be of significance. If lack of circumcision should prove to be of significance in the development of cervical cancer, a gradual reduction of this type of cancer may be expected in the United States. Among enlisted Navy personnel aged 20-29 Zullo[61] found 39 per cent circumcised. Of these, 55 per cent had been circumcised at birth; 33 per cent between the ages of 1 and 9; and the remainder before the age of 20. Among the younger generation, the circumcision rate is even higher in the United States. A recent study of American hospitals showed that in all private hospitals and in many of the city hospitals surveyed the circumcision rate among non-Jewish males averages around 80 to 85 per cent.[62] This rate seems to have been in effect for 10 to 20 years in many of these hospitals. In evaluating the future effect of these circumcision data on the inci-

dence of cervical cancer, the possible earlier age at first coitus among the younger as contrasted to the older generation must, of course, also be taken into consideration.

Marriage Factor.—The positive effects of marriage, age at first marriage, and first coitus, and number of marriages are consistent with: (a) differences between white and Negro women in this country, and (b) the apparent differences in India between Parsis and Christians on the one hand and Hindus on the other; (c) the relative rarity of cervical cancer among nuns, and (d) the apparently higher incidence of cervical cancer among women with syphilis.

The early age at first marriage in the cervical cancer group is also consistent with the higher incidence of cervical cancer in the lower social and economic classes, where early marriage is more common. Thus, out of some 400 patients seen at the Strang Cancer Prevention Clinic, which draws patients from a higher social level than the Memorial Gynecological Clinic, only 12 per cent were married before the age of 20. This compares with more than twice this figure among the Memorial Gynecological controls.

The etiological significance of these differences is of course debatable. The association with early marriage could, as Lombard and Potter[35] suggest, be a result of greater sensitivity of young tissue and of excessive hormonal stimulation. It could be a measure of duration and intensity of exposure; it could be an index to more frequent coitus and with a larger number of partners. One might also argue that early marriage, early coitus, and remarriage all increase the exposure to males with poor penile hygiene. For this to be more than a plausible conjecture, however, more evidence is needed, particularly on the possible carcinogenic effects of "smegma."[63, 64]

Pregnancy.—In comparing the number of pregnancies in the cervical cancer and control groups, we have been able to hold constant the effects of two associated variables, economic status and age at first marriage. The first was controlled approximately by confining interviews almost entirely to the clinic population; the second by direct cross tabulation against age at first marriage. When these two major variables are controlled, no difference in number of pregnancies between women with cervical cancer and a comparable group with other gynecological complaints is apparent. The strong association between age at first marriage and number of pregnancies is shown not only in our data, but also by the Milbank Memorial Fund's study of fertility.[65] This association would appear to suggest the desirability of re-examination of previous results on the role of number of pregnancies in the light of possible disturbing effects introduced by differences in age at first marriage.

Effect of Abstinence.—In view of the suggestion that the Jewish law of abstinence after menses might partially account for the lower incidence of cervical cancer among Jewish women, we studied this factor with special interest. The abstinence data show no uniform tendencies. It is true that Jewish patients with cancer of the cervix less frequently follow the Talmudic law of abstinence than control patients, but after allowing for the factor of extramarital relations and earlier onset of coitus among the patients with

cervical cancer, no apparent differences remain. The remaining sample with cervical cancer is very small, however. If the abstinence data reported to us by non-Jewish women were completely accurate, the absence of any difference between cervix and control patients in this regard would be of great significance. The great difficulties involved in accurately reporting a practice, the importance of which may change with advancing age, suggest the necessity of evaluating this result with some reserve. More information on the abstinence question may become available when the young Jewish women who do not practice the law to the same extent reach the cancer age. Even here, however, earlier onset at first coitus, as well as possible greater exposure to uncircumcised males, presents an obvious complication.

Contraceptives.—A proper evaluation of the factor of contraceptives is difficult because our data on the frequency of use are inadequate. The data suggest a slightly greater use of condoms among the control patients than in the cervical cancer group. There is also a suggestion that among cervical cancer patients there were more who never practiced contraception than were found among the respective control groups. In view of the absence of adequate frequency data on the use of contraceptives, no definitive conclusions can be drawn from these data.

Histologic Differences.—The results of the study are based on the epidermoid type of cervical cancer. The data on the adenocarcinomas of the cervix are too few to permit evaluations similar to those made for epidermoid cancer of the cervix. The present frequency data on adenocarcinomas among Jewish women, however, suggest that the etiology of this type of cancer may be different from that of epidermoid cancers. The fact that adenocarcinomas predominate when cancer of the cervix occurs in the young also points to a different pattern of etiology of this type. It is of interest to note that one Jewish patient was reported to have a squamous-cell carcinoma on biopsy, but was later shown to have an adenocarcinoma on operation. This patient was included among the adenocarcinoma cases in this report.

Cancer of the cervix of the epidermoid type may occur in apparent virgins and in women with short duration of sexual exposures, though only relatively rarely. This appears evident also from Pollack and Taylor's[66] report which included 4 cases of epidermoid cancer of the cervix in patients under 20. The youngest patient with such a cancer in the literature is 16. Among these groups, adenocarcinomas seem more common. The present survey includes a 16-year-old girl, a virgin, with an adenocarcinoma of the cervix.

Data on carcinoma in situ are also too few to permit definitive conclusions. The rate of divorce and age at first coitus were in line with data for epidermoid cancers. There were three Jewish patients included in this report with carcinoma in situ, one of whom gave a history of multiple exposures to uncircumcised males. More data would have to be available in order that this particular type of research might contribute to the problem of determining what proportion of cancer in situ develops into invasive epidermoid cancer.

Other Factors.—Some of the suggested etiological factors enumerated in the introduction of this report, such as diet, cervical lacerations, and chronic cervicitis, cannot be easily investigated by an interview and thus have not been covered. The frequency of chronic cervicitis, however, among our white non-Jewish, Jewish, and Negro controls is about the same, suggesting that, even if it is etiologically significant, other factors are required to explain the difference in incidence among these groups, as has been previously stressed by McKelvey.[48]

Results Relative to Incidence Data.—The effects of early coitus, remarriage, and circumcision are consistent with incidence differences between Jewish and non-Jewish women, white and Negroes, and the various religious groups in India. Thus, added significance is given to these factors. It is scarcely necessary to emphasize that if subsequent investigations confirm the role of circumcision, the preventive implications for many parts of the world will be far from trivial.

Multiple Etiological Factors.—Carcinogenesis represents the effect of many factors, some of which may be endogenous and some exogenous. In the development of epidermoid cancer, exogenous factors seem to be of particular importance. Yet even this type of neoplasm is the result of multiple factors, many of which remain unknown in our current state of knowledge.

In our studies we can only throw light on some of these factors, hoping that, through them, we might advance our understanding of others. Yet, if our understanding of any given factor, however small, may lead to a possible reduction of such a cancer by practical preventive measures, then, though the total mechanism of cancer production may remain undetermined, our efforts must be pointed in that direction.

Summary and Conclusions

1. Environmental factors suspected to play a role in the development of cancer of the cervix were studied by the interview technique.

2. The patient material consists of patients with cancer of the cervix in several American and Indian hospitals. American control groups were represented by patients with pelvic diseases other than cancer of the cervix.

3. Due to basic differences in incidence rates, analysis of non-Jewish whites, Jewish whites, and Negroes was carried out independently. Similarly, Indian data were analyzed separately for Hindu, Moslem, Christian, and Parsi patients.

4. Cervical cancer patients had a significantly earlier age at first coitus and age at first marriage than the control groups.

5. The age at first coitus was earliest among Negro controls and latest among Jewish controls. In the Indian study, the age at first coitus was earliest among Hindu and Moslem women and latest among Christian and Parsi patients.

6. Multiple marriages were found to be very much more common among cervical cancer than among control patients.

7. Patients with cancer of the cervix were more frequently exposed to uncircumcised males than the corresponding control patients.

8. The use of contraceptives remains a questionable variable because of the difficulty associated with obtaining information on the frequency of use.

9. No statistical association between the number of pregnancies and cervical cancer could be obtained after eliminating the effects of age at first marriage, considering only married women and comparing groups of similar economic status.

10. Present evidence on the effect of abstinence suggests that abstinence after menses may not be as important a factor as has been supposed.

11. Data on syphilis suggest that the statistical association between this disease and cervical cancer could be accounted for by the earlier age at first coitus among cervical cancer patients with syphilis, as compared to patients with cervical cancer without syphilis.

12. Negative variables include onset and flow of menses, method of delivery, irritative discharge, frequency of douching, and history of gonorrhea.

13. Epidermoid cancer of the cervix has been noted in women exposed only to circumcised males and in virgins. Other etiological factors than those involving coitus and lack of circumcision must therefore exist.

14. Examination of penile hygiene among the various groups studied shows that males of population groups with a high incidence of cervical cancer have poor penile hygiene.

15. The present results are compatible with the concept that those population groups having a late age at first coitus and first marriage and a low remarriage rate, whose men are circumcised, have a lower rate of carcinoma of the cervix.

16. Possible interpretations of these results and their preventive implications have been discussed.

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Discussion

DR. JOSEPH NATHANSON.—In order to appreciate the tremendous work which these gentlemen have presented, especially from the standpoint of the adherence to ritual laws, I trust you will allow me to present a résumé of them. In the first place, in no religion in the history of the human race, have the laws, as they are known in the Hebrew, Nidah, which means separation from the husband, been so long existent. They were promulgated in Biblical times, certainly over 4,000 years ago, and in spite of the very many Diasporas, they had been carried out with a great degree of adherence until about 100 years ago.

Now what are these laws? In the first place, the laws are that, whether a woman menstruates normally five days or one day, the minimum time during which she must call herself absolutely unclean is five days. In other words, if she menstruates only one day a month throughout her life, from the standpoint of the Mosaic laws, she is known to be unclean for five days plus a period of seven days beyond that.

Again, any woman who has any spotting larger in extent than three-quarters of an inch in diameter at any time in the month immediately is looked upon or regarded as an unclean woman. She is analogous to the menstruating woman, and is therefore subject to the Mosaic laws of menstruation. If a woman should menstruate for three days, she would necessarily have an unclean period of twelve days. If she spotted after the first coitus, again she would have to go through 12 more days. The implications of such episodes are at once apparent. It reduces the period of exposure to coitus, as the essayists have said, to a very considerable degree. As a matter of fact, this rationing puts to shame the rationing which was prevalent in the halcyon days of the New Deal. Some of these women were literally being placed in "sexual ostracism."

Although the question of contraception was not touched upon by the essayists, I think that it is important to discuss it. If smegma is irritating, and if the male wears a contraceptive device then the irritating factor should be reduced. If the male does not use it, but the female employs a contraceptive, is she preventing the smegma from irritating the cervix, or is she in turn irritating the cervix by the contraceptive? That point would be worth investigating.

It is important to note that in the Jewish race itself, if a couple adheres to the Mosaic laws of sexual practices, the male cannot use any device or contraceptive himself. On the other hand, the female is allowed to use a contraceptive.

With regard to how many women really observe the Mosaic laws of menstruation to the letter of the law, or even partially, at the present time, I should like to give you some figures which the late Dr. Hiram Vineberg presented in a paper about 30 years ago, on the same subject which is under discussion, namely, the differences in the racial incidence of carcinoma of the cervix. During these years, 1893-1903, he found cancer of the cervix in New York City was 20 times as frequent in non-Jews as in the Jews. That is significant, because you will remember that was the period in which the peak of immigration from Eastern Europe occurred. The majority of Jewish women during that period observed the Mosaic laws of menstruation most faithfully. Then in the decade from 1909 to 1918 the rate had dropped to 7½ times as frequent in non-Jews as in the Jews. Even in Israel, there is now an appreciable incidence of carcinoma of the cervix. It may be of interest and quite surprising to you to know that, in my own 30 years of practice, I have never seen a case of primary carcinoma of the cervix in a private patient. I have seen a few cases of stump carcinoma at the Woman's Hospital in Jewish patients, and carcinoma of the cervix in a few Jewish women on another ward service.

I believe that no finality can be placed upon the Mosaic laws of menstruation as an explanation of the low incidence of cancer of the cervix in the Jewish race. At the present time they play rather an insignificant part I believe, and I feel, therefore, that another aspect deserves serious thought. The answer cannot come and will not come until at least two and perhaps three generations have passed, because few Jewish women are now

adhering to the Mosaic laws of menstruation. It is my opinion that about 95 per cent of the Jewish women in this city are not observing the laws of Nidah. This is not my own estimate; colleagues who have similar types of practice agree with me. Even rabbis have informed me in recent weeks that their impression is similar to ours. One rabbi told me recently that in a period of 18 years he had never been consulted by any Jewish woman in his congregation as to how to carry out the Mosaic laws of menstruation. Thus, at the present time, I do not believe that with the information at hand we are justified in stating that the Mosaic laws per se are the important factor in the prevention of carcinoma of the cervix in the Jewish race.

I believe Dr. Wynder said that one of the more definite observations was that if women married late and had coitus for the first time late in life the incidence of carcinoma is lower. Is that correct?

DR. WYNDER.—That is correct.

DR. NATHANSON.—If that is so, it is paradoxical to note that the Old Testament admonished the Jewish race to undertake early marriage. We should therefore have had a higher incidence of carcinoma in the Jews because they married earlier and they had coitus much earlier. How then can you account for the discrepancy? It is my belief, and of course it is only a belief, this will resolve itself into a question in which the geneticist will finally answer the problem. In other words, I believe, at least to a degree, that, for some reason or other, whether you call it biologic, or whether it is because for a period of over 4,000 years Jewish females have observed the Mosaic laws of menstruation and have therefore been subjected to less irritation over generations, say a couple of hundred generations, the cervical epithelium in the Jewish woman has become endowed with the ability to resist neoplastic changes of a malignant type better than can that of her non-Jewish sister, who has not had the benefit of markedly reduced irritation of the lower genital tract.

DR. FRANK R. SMITH.—Although I did not know that Dr. Wynder was doing this work in connection with the Gynecological Service at Memorial Hospital, I was interested to see that he has followed rather closely the pattern of study that I undertook at the same hospital in 1927.

In an effort to find out why some women developed cancer, we took a group of cancer patients and a group of controls and used a questionnaire.

The striking point that came from our study was the racial difference. After I found it appearing in the figures I began looking up the literature and found that the infrequency of cancer of the cervix in Jewish women was mentioned in a report from the Mayo Clinic about five years before. The other factor that came up was the use of Lysol douches. It was astonishing to note the number of women who used Lysol douches in the cancer group and the practical absence of their use in the control group. We noticed also in the cancer group that the time between marriage and the first pregnancy seemed to be greater than in the controls.

The observation about the Lysol douche illustrates one of the dangers in this type of analysis. The reason that women with cancer of the cervix used Lysol douches was because they had leukorrhea. The controls who were taken from another hospital did not have the necessity for douches.

I spent four and one-half years before the war chasing monkeys in pursuit of the answer to the Lysol problem. Every day one of us applied Lysol in different strengths to the vagina on tampons. Every three months we biopsied the cervices. It was pretty hard to get monkeys that had had young and were in good health, but we used about 18 in all. We were just beginning to get what looked like basal-layer changes in the cervix in the group in which the stronger solution of Lysol was used, when the war put an end to the work. So the experiment, except for the slides, which I still have, appears to have been worthless. It did not prove or disprove anything. Allen's group in New Haven used smegma in various dilutions for injection into the cervix, but without any positive results.

One must recognize the danger of using figures, and be very careful of interpretations. In our study we found that whereas Jewish women made up about 48 to 49 per cent of the benign cases in Memorial Hospital, they comprised less than 4 per cent of our cancer group. Italians, who are pretty prolific, made up only 8 per cent of our cross section, yet they represented over 20 per cent of our cases of cancer of the cervix.

I doubt that diet has much to do with the protection against cancer of the cervix, which brings us down to the question of circumcision as the explanation of the low incidence of cervix cancer in Jewish women. Circumcision is, of course, not peculiar to the Jewish people. In the Fiji Islands, where the population is made up of two groups, racially and culturally distinct, cancer of the cervix never appears in the group that practices circumcision.

DR. SAMUEL WOLFE.—Immunity of Jewish women to cancer of the cervix may result from either racial resistance or from sexual practices different from those followed by other peoples. The factors involved in circumcision of the male and the practice of sexual abstinence for one week after menses have been considered by previous speakers.

The research as reported tonight suggests a natural resistance to cancer by Jewish women but for validity investigation along broader anthropological lines is required. The peoples of Europe and America are of Indo-Aryan stock while those of Jewish extraction are of Semitic derivation. Other peoples of Semitic origin, i.e., Arabs, should also be similarly investigated as a control group. If by such studies freedom from cancer of the cervix is shown in Jewish women only, conformity to their religious sexual regulations may be then inferred as the likely factor in freedom from cancer. If women of both Jewish and Arabic stock should show a low incidence of carcinoma, racial resistance would appear to be the answer.

DR. HOWARD C. TAYLOR, JR.—I would like to draw attention to the general importance of the method which has been demonstrated to us for the study of cancer of the cervix. This method by which the patient's previous environment is surveyed in great detail may be applied to a good many types of chronic illness.

I doubt that there have been previous studies of cancer of the cervix made with such detail and with such a consideration for the validity of statistics, as has been presented tonight.

We do, however, as listeners, have to reach for some tangible conclusions from these statistics. The first efforts to find such a definite conclusion are perhaps a little disappointing. It seems to me that two rather contrasted theories have been offered. One view seems to be that extrinsic factors, in which various aspects of sex hygiene are important, play the principal role in the causation of cancer of the cervix. The other view seems to be that differences are intrinsic, constitutional, or perhaps genetic. I wonder whether the speaker in conclusion would address his remarks to these two rather divergent points of view.

DR. SAUL B. GUSBERG.—I would like to ask a question: Does this same disparity exist between these groups in intra-epithelial carcinoma of the cervix? That is a question we have often been asked.

DR. WYNDER (Closing).—First of all, I would like to state that we have learned a very great deal from the points the various discussers have raised. We are quite cognizant of the fact that the work done by Dr. Smith and others has given us many valuable leads to our studies. The studies presented tonight are just excerpts of a larger undertaking, which has gone into some detail on most of the points raised.

We have studied douching and found there was no statistical significance in Lysol douchings or in any type of douching. In India, hardly any of the patients, in either the control or the cervix cases, use douching.

The question of contraceptives is a most difficult one. We found a slightly greater use of condoms in the control group as compared to the cervix group, but because of the difficulty of obtaining data on contraceptives, we are not placing too much value on this. Diaphragms were used in less than 5 per cent of the group of patients studied.

It should be emphasized that the control patients in this type of study are most important, a point frequently not recognized. Every control patient is as important as every patient with the type of cancer that we are studying. We have analyzed the control patients not only for age and economic standing, but also for religion, native background, and descent, as well as for hospitals of admission. Where differences existed, we have standardized for these differences, so that we believe that our controls are as comparable to the cervix cases as possible.

In regard to abstinence, we must consider the following: Certainly a woman who abstains for seven days and is truly religious is much less likely to have extramarital relationships, so that these two facts are most difficult to keep apart. We found that those Jewish women with cancer of the cervix who did have extramarital relationships did not practice abstinence. Therefore, these factors are very difficult to separate.

The factor of prostitution was mentioned. I had occasion on a visit to Denmark last month to see a study not yet published by Dr. Røjel in which he found that in Denmark prostitutes had as much as four times more cancer of the cervix than other women of the same economic standing.

Dr. Symeonidis pointed out a relatively high circumcision rate among Negroes. We initially found a similar fact, but as we became more careful in our question on circumcision, we found that Negroes do not circumcise more at birth, but they do practice a slightly greater amount of circumcision in their teens. However, we found a peculiar response among Negroes. For instance, if a Negro male patient was asked, "Were you circumcised?" he frequently said, "Yes," because he felt if he said he was not circumcised, we might perform the operation.

A point which interests me is the apparent lesser frequency or incidence of cancer of the cervix in Israel than in New York City. Might this possibly be explained on the basis of the fact that if a woman has extramarital relationships in New York City, she is more likely to have them with an uncircumcised male than in Israel where most men are circumcised?

A question was raised about the occurrence of cervical cancer in clinic and private patients. It is well known that cancer of the cervix occurs less commonly among private patients. As we have demonstrated there is certainly better penile hygiene among patients in the higher income group. It must also be considered that the age at first marriage is later in the private patients. We have conducted a survey of private patients at Memorial Hospital and found a significantly later age at first marriage among them as compared to our clinic patients.

There is one other point about the histologic variations that deserves comment. We separated our results into epidermoid cancer, carcinoma in situ, and adenocarcinoma. There were not enough data available on carcinoma in situ to analyze these statistically, but they appear to go in the same direction as the epidermoid cancer data. In adenocarcinoma, however, which we did not analyze statistically, we found, as has been pointed out previously, the incidence among Jewish women to be the same as among the non-Jewish. I think this reiterates the point that the etiology of epidermoid and adenocarcinoma is entirely different.

Another point I would like to stress refers to genetic factors and hormonal drive in respect to cancer of the cervix. Genetic factors have often been thought to be of etiological significance in many types of cancers, such as liver cancer among the Bantus, until it was shown that certain dietary factors could explain the high incidence of this

cancer. Similarly, in cancer of the lung it was suggested that women have a genetic resistance until it was shown that the greater amount of smoking among males could explain this difference.

In India, we have similar genetic backgrounds in the Hindus, Moslems, and Christians, who are all from the same racial stock. Most of the Moslems and Christians are converts from the Hindu religion. The marked difference in frequency of cancer of the cervix can perhaps be best explained by the exogenous factors outlined.

What about the factor of hormonal drive influencing the sexual drive of a given woman? I believe that mores and social customs govern the onset and intensity of coitus rather than hormonal drive.

Finally, I should like to point to a factor which is becoming more and more accepted. Epidermoid cancer behaves quite differently from the other cancers. Epidermoid cancers rarely occur in sites not exposed to exogenous factors of irritation. Epidermoid cancer of the lung is a very uncommon occurrence in nonsmokers. Epidermoid cancer of the tongue, buccal mucosa, and larynx is very uncommon in patients not exposed to some exogenous factor of irritation. Epidermoid cancer of the cervix is very uncommon in virgins. So I think that, in view of the present evidence, the working hypothesis must be that extrinsic factors are operating here. We are quite aware that cancer is a concerted effort of many endogenous and exogenous factors, but we must strike at those factors which we can handle with the greatest degree of practical success.

AN ANALYSIS OF 56 DEATHS IN 56,456 LIVE BIRTHS FROM MARGARET HAGUE MATERNITY HOSPITAL*

JOHN N. CONNELL, M.D., F.A.C.S., JERSEY CITY, N. J.

IN 1944 James F. Norton[1] reported 187 maternal deaths in 66,376 live births from the Margaret Hague Maternity Hospital. These deaths occurred from the opening of the hospital in October, 1931, through 1943, a period of twelve years (Table I). This was a mortality rate of 2.8 per 1,000 live births. This is an analysis of 56 maternal deaths in 56,456 live births from January, 1944, through 1950, a mortality rate of slightly less than 1.0 per 1,000 live births (Table II).

Norton excluded only two cases of infected criminal abortions. No cases are excluded in this report.

TABLE I. MATERNAL DEATHS, 1931 THROUGH 1943, IN 66,376 LIVE BIRTHS

Infection	42
Eclampsia	21
Other toxemias	18
Hemorrhage	18
Rheumatic heart disease	14
Pneumonia	12
Rupture of uterus	11
Sudden death	11
Anesthesia	8
Tuberculosis	8
Other causes	24
	187

TABLE II. MATERNAL DEATHS, 1944 THROUGH 1950, IN 56,456 LIVE BIRTHS

Rheumatic heart disease	17
Infection	9
Eclampsia	6
Other toxemias	3
Embolic deaths	5
Sudden deaths	2
Other causes	5
Malignancy	4
Hemorrhage	3
Intestinal obstruction	2
	56

The Margaret Hague Maternity Hospital is a County Hospital with private, semiprivate, and ward services. The ward patients comprise only one-third of the admissions. It has an Obstetrical Staff, consisting of three divisions, and a large Courtesy Staff, made up of over 200 general practitioners. These doctors manage their patients in the hospital if there are no complica-

*Presented at a meeting of the New York Obstetrical Society, Oct. 14, 1952.

tions. If, on admission to the hospital, there is any deviation from the normal course, consultation with one of the Attending Staff is compulsory. The prenatal care, given by the large group of practitioners, has improved greatly in the last ten years, especially on the part of those doing a considerable amount of obstetrics. No pregnant or puerperal woman is ever refused admission, and signing a "release" has little meaning because these patients can apply for readmission at any time.

Discussion of Deaths from Rheumatic Heart Disease

Deaths from rheumatic heart disease head the list of maternal deaths at the Margaret Hague Maternity Hospital during this seven-year period. This is similar to the recent experience of other large obstetrical hospitals with comparable services. There were 17 deaths in cases of rheumatic heart disease complicated by pregnancy.

Eleven were private patients. Of these, 7 were admitted in cardiac failure. Two private patients developed cardiac failure during labor. One patient with Class 3 cardiac disease went into failure while in the hospital at bed rest, one finally became decompensated in the postpartum period.

Three were nonclinic patients who had no antepartum care and were admitted in failure.

Three, however, were registered in the clinic. One was a patient whom we could not control. She should have remained in the hospital at bed rest for the duration of pregnancy, but insisted upon signing releases to go home, only to return in more serious failure, and eventually to die in the hospital. The other two registered clinic patients were our responsibility. One, in 1945, a patient with rheumatic heart disease, should have been referred from the General Clinic to the Cardiac Clinic on two counts. She had rheumatic heart disease, and there was a change in the functional capacity of the heart during pregnancy.

The other patient registered in the Cardiac Clinic had a history of previous failure which was overlooked. After her admission to the hospital with acute pancreatitis, she should never have been discharged because of the previous heart failure. She was readmitted at term in active labor, apparently well compensated. Demerol and scopolamine were given intravenously, and five minutes later she went into acute cardiac failure, developed pulmonary edema, and died.

It has been the experience in some large obstetrical hospitals that the registered Cardiac Clinic patient with rheumatic heart disease has a much better expectancy, especially if she will cooperate fully, than the cardiac patient of the private physician, whether he is a practitioner of the Courtesy Staff or one of the obstetricians. This, too, has been our experience.

A few private patients were followed in pregnancy by cardiologists, who were much more lenient in their management than our own cardiologists would have been. In our experience, cardiologists who are not constantly observing pregnant women with rheumatic heart disease, especially those with

a history of previous failure or those who have been in Class 3 or 4 at some time in the past, are prone to be unduly optimistic. It is not surprising then that the general practitioner sometimes overlooks the past history of the pregnant cardiac patient or fails to recognize early signs of changing functional capacity in pregnancy, and hospitalizes his patients too late.

A total of seven of these patients were admitted to the hospital in cardiac failure, and of these all but one gave a history of previous failure. Four patients failed in labor—and two of these had histories of previous failure.

In 1946, one patient with a history of previous failure was admitted because of this at nine weeks. She was a Class 3 cardiac patient on admission, had heart failure, and died in the hospital after 195 days. From 1946 through 1950, more than 300 registered Cardiac Clinic patients have gone through pregnancy, labor, and delivery with one failure and one death.

Pregnancy is not recommended for women with serious rheumatic heart disease, especially those with previous failure or whose status places them in Class 3 or 4. For these women it has definite hazards if they do not adhere rigidly to the management outlined by the cardiologist and obstetrician who are constantly confronted with this problem. If such women happen to become pregnant, they should be hospitalized and kept in bed for the duration of the pregnancy.[6]

Puerperal Infection

Nine deaths are listed as being due to puerperal infection.

Two deaths occurred in women admitted with infected abortions. One death, at twenty-two weeks' gestation, was caused by gonococcus septicemia. One patient was admitted with an intrapartum infection, had a positive intrapartum *Staphylococcus aureus* blood culture, and died on the second postpartum day. One death, in 1946, occurred in a gravida vi, para v, delivered at home of a 12-pound stillborn baby. After two days of fever, she was admitted. There was no inversion of the uterus or rupture. Urine and cervical cultures showed *Escherichia coli* organisms. Death occurred thirty-six hours after admission. We seem not to have been responsible for the 5 deaths just described, although they are included in the 56 maternal deaths.

Two of the nine deaths from infection were in multigravidas with diabetes who had had large babies with previous deliveries. Both had impacted shoulders of large babies, difficult deliveries, and almost certainly too much fundal and other trauma. Chemotherapy was started late in both, and the infecting organisms, *E. coli, Staphylococcus aureus,* and *Streptococcus hemolyticus* were exogenous. There were preventable factors in both.

In 2 others there were likewise preventable considerations. In one, after a thirteen hour labor and normal delivery, morbidity developed on the first postpartum day. The blood culture was positive for anaerobic streptococcus. Antimicrobial therapy was started late and was inadequate in amount. Death occurred after fifty days and the autopsy confirmed the diagnosis of puerperal infection.

The last death in this clinic from puerperal infection occurred in 1947. In this patient after twenty-seven hours of labor and thirty-eight hours of ruptured membranes, an extraperitoneal cesarean section was done for fetopelvic disproportion, with a blood loss of only 250 c.c. Fever developed on the first postoperative day with marked abdominal distention and vomiting. Wangensteen suction, intravenous fluids, and transfusions were employed, but there was no chemotherapy. Death occurred on the sixth postoperative day after the fever had ranged from 102 to 108° F. Postmortem exploration of the area of the operation showed no gross evidence of wound infection or peritonitis. Tremendous dilatation of the

stomach was present. Cultures of the wound site and peritoneum showed *Streptococcus faecalis* although the operative uterine culture had been negative. Microscopic sections of the uterus showed marked necrosis all over the endometrial surface with rich infiltration of polymorphonuclear leukocytes. Some of the larger uterine veins were filled with purulent exudate and the large veins of the cervix were thrombosed.

Deaths from puerperal infection are and should be rare in an obstetrical hospital. They continue to be one of the chief causes of maternal mortality in the vital statistics of the country as a whole.[2] Adequate and conscientious masking, routine cultures of the nasopharynx of all persons in contact with the parturient, good management of prolonged labor, and the proper timing of operative deliveries, together with small frequent transfusions and good nursing care, were reducing the incidence of and maternal mortality from infection at the start of the chemotherapeutic era. These principles must never be relaxed. Up to July, 1951, penicillin had been used prophylactically for four or five years with seemingly good results. This was just an impression, not borne out by the recent work of Sattenspiel and Chesley[7] in our hospital. Absorption of oral sulfonamides during labor seemed to be unpredictable. Penicillin, the sulfonamides, or streptomycin have been used for treatment during the period of this report, usually as soon as the parturient became morbid and before culture reports were returned. Chief dependence has been on penicillin given in much larger doses than in most of these case reports.

Although penicillin is probably the best antibiotic for the treatment of gram-positive infections due to staphylococci, pneumococci, and hemolytic streptococci, clinical response has been good with Aureomycin, Terramycin, and Chloromycetin. Because of the knowledge that some strains of streptococci are resistant to or not killed by penicillin and may even grow at a greater rate when one of the three newer antibiotics is then used, its frequent use prophylactically seems not to be sound. The reports of Guilbeau,[3] Hesseltine,[4] and others concerning the prophylactic oral use of Aureomycin during labor and the early puerperium are stimulating. At the Margaret Hague Maternity Hospital, Aureomycin, Terramycin, and Chloromycetin are under trial at present in different groups of patients. There recently have been 2 seriously ill patients with coli-aerogenes blood stream infections who did not respond to Aureomycin but did to Terramycin.

On the First Division any morbidity during labor, or the postpartum, or postcesarean section course including the first day is considered and treated as puerperal infection unless the fever is clearly caused by something else. Postcesarean section morbidity of the first few days may have some benign explanation, but how can it be distinguished from puerperal infection? The object of prophylactic and early antimicrobial therapy in cases of morbidity is to limit the infection to the endometrium.

Eclampsia

Of the 6 patients who died of eclampsia from 1944 through 1950, 3 were private patients, one a nonclinic patient, and 2 were women transferred from the small local Salvation Army Hospital. There were 3 autopsies, and in

each, cerebral hemorrhage was present. Although the incidence of eclampsia at the Margaret Hague Maternity Hospital has, of course, decreased, the maternal mortality remains high—about 10 per cent.

As obstetricians, we tend to think of eclampsia as a preventable disease. Actually it is not entirely preventable and will not be until the cause of the specific toxemia of pregnancy is known. Pre-eclampsia itself is not entirely preventable. If eclampsia is always preceded by pre-eclampsia, eclampsia probably will not be entirely prevented until its forerunner is eliminated.

Patients with pre-eclampsia occasionally develop eclampsia while in the hospital under treatment. About 20 per cent of our eclamptic patients have never had more than borderline hypertension. Forty-seven per cent were classified as having "mild" pre-eclampsia until the convulsion. This, we feel, is one reason for dropping the designation "mild" from the classification of the toxemias of pregnancy.

TABLE III. THE DECREASING INCIDENCE OF ECLAMPSIA AT THE MARGARET HAGUE MATERNITY HOSPITAL

YEARS	LIVE BIRTHS	CASES	ECLAMPSIA INCIDENCE (%)	DEATHS
1931-34	14,667	86	0.59	10
1935-39	27,809	90	0.32	7
1940-45	39,454	72	0.18	8
1946-50	40,910	44	0.11	5
Totals	122,840	292	0.24	30

Other Toxemias

Three deaths are listed as due to "other toxemias."

The first woman, in 1945, was 28 years of age, para iii, gravida iv, with known hypertension, who was admitted at thirty weeks' gestation in shock with a complete abruption of the placenta. She was sectioned, required 1,700 c.c. of blood to combat shock, and died five days postoperatively after 27 convulsions. The autopsy report was malignant nephrosclerosis, fatty degeneration of the liver, thrombosis of the middle meningeal artery, and encephalomalacia.

Case 2 was a para ii, gravida iv, aged 25 years, twenty-eight weeks pregnant, who was admitted with flank pain; gross hematuria, hypertension, purpura, and anemia. She died undelivered, four days after admission, in coma. The autopsy report was nephrosclerosis and yellow degeneration of the liver.

Whether or not Case 3 had pre-eclampsia superimposed on a previously damaged vascular tree or had a cerebral hemorrhage death in no way related to pregnancy is difficult to prove. The postmortem diagnoses were cerebral hemorrhage, chronic nephropathy, and acute yellow atrophy of the liver.

Deaths From Embolism

There were 5 deaths due to embolus. Two additional sudden, unexpected deaths were apparently due to other causes.

One instance of sudden death occurred in a young woman (Case 2 in Table IV) admitted to the delivery floor with caput showing. She died during the perineal repair, after spontaneous delivery, and before the placenta was expressed. There was no hemorrhage. The anesthesia was gas oxygen. At postmortem the anatomical diagnoses were: acute cardiac

TABLE IV. DEATHS FROM EMBOLISM

CASE NUMBER	ANTEPARTUM AND INTRAPARTUM COURSE	POSTPARTUM COMPLICATIONS	REMARKS	FINAL CLASSIFICATION
1. 1944 Age 39 Gravida xi Para x 40 weeks Clinic	Pre-eclampsia. Normal spontaneous delivery. 3 hours' labor. Live baby.	Postpartum normal to sixth day. First day up, pain right chest. No cough or fever. Discharged seventh postpartum day. Readmitted 2 days later with signs of pulmonary infarction.	Apparent improvement for 6 days; 8 days after readmission recurrence of embolization. Death 9 days after readmission. No anticoagulant therapy.	Autopsy. Acute purulent embolization. Septic infarction right lung. Acute endometritis. Thrombophlebitis ovarian vein. Preventable factors.
2. 1944 Age 24 Gravida ii Para i 37 weeks Private	Respiration suddenly ceased before third stage of labor. Normal spontaneous delivery. Live baby 4 hours' labor.	No intra- or postpartum bleeding.	Autopsy. Large hemorrhage right adrenal capsule. Partial atelectasis both lower lobes.	Not preventable.
3. 1945 Age 28 Gravida ii Para i 40 weeks Private	Low forceps. Live baby. 5 hours' labor.	Up on sixth day. Pain in chest. On seventh day negative cough, chest, legs. Temperature 100.8° F., pulse 96. Bed on eighth postpartum day. Died on way to x-ray.	No anticoagulant therapy. No autopsy.	Preventable factors.
4. 1946 Age 22 Gravida i Para 0 40 weeks Private	Normal spontaneous delivery. 11 hours' labor. Live baby.	Temperature 104° F., first day post partum. Superficial thrombophebitis left thigh.	Two Paravertebral blocks. Up on eighth day, in error. Died in bathroom. No anticoagulant therapy.	Preventable factors.

5. 1950 Age 30 Gravida ii Para i 7 weeks Private			Admitted for vomiting of pregnancy. Up after 6 days. On eighth day pain in right chest. No fever. Negative x-rays. On tenth to thirteenth days back to bed for vomiting. Intravenous fluids, Temperature 100.8° F., pulse 120. Up again after 20 days. Found dead in hall. No anticoagulant therapy.	Preventable factors.
6. 1950 Age 32 Gravida i Para 0 40 weeks Private	Extraperitoneal cesarean section after 40 hours' labor and 42 hours of ruptured membranes and failed forceps. Live baby.	Low grade temperature postpartum, 99-100.8° F. Up 4 days postpartum, stiffness left leg. Not examined. Up on eighth day postpartum. Pain and edema left leg. Died suddenly.	Pulmonary embolization. Phlebothrombosis left leg. No anticoagulant therapy.	Preventable factors.
7. 1950 Age 39 Gravida iii Para i 37 weeks Clinic	Thirteen clinic visits. All normal. Admitted in labor 6:30 P.M. At 8 P.M. Blood pressure 120/96, at 12 P.M. 106/78. Cervix 1½ fingers' dilatation. At 12:10 A.M. sudden convulsive seizure. Died in 9 minutes.	Postmortem cesarean section, living boy. Died in 2 days.	Post mortem. Anatomical diagnoses: (1) Small hemorrhage of liver and heart muscle. (2) Edema of brain. Microscopic. Massive necrosis of pancreas with hemorrhage. No evidence of acute pancreatitis.	Not preventable.

dilatation; cardiovascular collapse; large hemorrhage of the right adrenal capsule; partial atelectasis of both lower lobes; multiple serous hemorrhages; marked hydronephrosis of the right kidney.

The other sudden death, not due to embolus, occurred after five hours of normal labor and was never satisfactorily explained even after postmortem examination.

The remaining five deaths were due to embolus. Close scrutiny of the charts reveals ominous warnings that were overlooked or not heeded.

Case 1 of this group was a gravida xi, para x, discharged from the hospital the day after experiencing a sharp pain in the back of the right side of the chest. There was no fever or cough and the lungs were negative to physical examination, and anticoagulant therapy was not instituted. On readmission two days later, she displayed the classical signs of pulmonary infarction and was given the usual treatment for this. After some subjective improvement, death occurred on the ninth hospital day with signs of fresh recurrent pulmonary embolization. The postmortem anatomical diagnoses were: acute purulent embolization; septic infarct of the right lung; acute necrotizing endometritis; thrombophlebitis of the ovarian vein.

Case 3, gravida ii, para i, aged 28 years, was delivered by low forceps after a short labor. After six normal postpartum days, she was allowed up. The next day there was sharp pain in the left side of the chest with no abnormal physical findings except a temperature of 100° F. and a pulse rate of 96. Pain and low-grade fever continued through the eighth postpartum day and, upon being moved to a stretcher for x-ray, she suddenly died. There was no anticoagulant therapy and no autopsy.

Case 4 of this group was a primigravida of 22 years who had a normal spontaneous delivery after eleven hours of labor. There was morbidity (temperature of 104°) the first day post partum and a superficial thrombophlebitis of the left thigh. There was no clinical evidence of deep thrombosis. A paravertebral block and penicillin were given on the second postpartum day. The paravertebral block was repeated on the fourth day. She was allowed up out of bed on the ninth day and was discovered dead in the bathroom. There was no anticoagulant therapy and no postmortem.

The fifth patient was a gravida ii, para i, aged 30 years, admitted for vomiting of pregnancy in the sixth week of gestation. She was out of bed and improved on the sixth hospital day. Two days later she complained of pain in the right side of the chest. There was no cough or bloody expectoration, no elevation of temperature, pulse, or respiration. Pain persisted for twenty-four hours with no objective findings, and the chest x-ray was negative. Recurrence of vomiting caused a resumption of the intravenous therapy and return to bed rest. During this period the chart indicates that the temperature was 100.8° F. and the pulse 110, and this elevation continued. Out of bed on the eighteenth hospital day, she was found semicomatose in the corridor and died soon after. There had been no anticoagulant therapy. The postmortem anatomical diagnoses were: embolization of the pulmonary artery at its bifurcation; infarction and embolism of the right lung; acute cardiac dilatation; congestion and edema of the brain. The veins of the arms were not dissected.

Case 6 was in a 32-year-old para 0, gravida i, who had an extraperitoneal cesarean section after forty hours of labor and forty-two hours of ruptured membranes. A trial forceps delivery was unsuccessful. She had a low-grade temperature of 99 to 100.8° F., but was out of bed. On the fourth postoperative day, she complained of stiffness in the left leg, but the legs were not examined. The patient died suddenly while up and about on the eighth day. Autopsy confirmed the diagnosis of pulmonary embolization and phlebothrombosis of the veins of the left leg. There was no anticoagulant therapy. This was the first cesarean-section death since 1947 and the only one in 1,356 cesarean sections from 1948 through 1951. It might have been prevented.

Comment

There seem to be preventable factors in several or all of these deaths from embolus, although practices differ and peripheral vascular experts do not agree. Is not anticoagulant therapy indicated in puerperal women with severe chest pain and negative clinical and x-ray findings? Should it not always be employed when the patient exhibits chest pain and low-grade fever and some elevation of the pulse rate without evident cause?

Is, or is not, anticoagulant therapy indicated in the presence of only superficial thrombophlebitis? Are morbid puerperal women, postpartum or postoperative, candidates for early rising? That pulmonary embolization and infarction are a sequel to puerperal infection with pelvic thrombophlebitis has long been known. Is not anticoagulant therapy indicated, with close laboratory checks of prothrombin percentages, when there is evidence of puerperal infection with extension to the parametrial tissues and almost certainly pelvic thrombophlebitis? Or, must we delay until there is evidence of pulmonary embolization?

Other Causes

Under "other causes" there were 5 deaths.

In 1946, one patient, after a normal delivery, died forty-three days later of thrombocytopenic purpura. The second, in 1948, after a normal delivery and discharge from the hospital on the seventh postpartum day, was readmitted three weeks later in coma with jaundice and fever. She died five hours after admission of infectious hepatitis. The third, in 1948, was admitted in the thirty-sixth week of her pregnancy with signs of acute cholecystitis and cholangitis. Three days after admission the common bile duct was drained, with death occurring twenty minutes after operation. Autopsy showed acute purulent cholangitis and peritonitis. These three deaths were not preventable.

The fourth case was a 29-year-old para i gravida ii, thirty-seven weeks pregnant, admitted in labor on Oct. 28, 1948. A stillborn baby was delivered spontaneously. She signed a release on the third postpartum day and was readmitted five days later in coma. Death occurred three days after readmission. The postpartum course at home was "normal" until sudden loss of consciousness. There was no jaundice and the spinal fluid was clear. There was no autopsy. The medical diagnoses were: 1. vascular accident? 2. encephalitis?

The fifth death under this heading occurred in 1950 and was charged to anesthesia. This woman was 38 years old, a para ii gravida iv, twenty-seven weeks pregnant, admitted with acute appendicitis, with perforation and diffuse peritonitis of three days' duration. Five hours after admission, operation was performed under spinal anesthesia, with 16 mg. of Pontocaine in 2 c.c. of glucose. Five minutes later respiration ceased followed by cardiac arrest. Cardiac massage was given. She died two hours postoperatively. The autopsy confirmed the operative findings of acute purulent appendicitis with rupture and peritonitis.

Malignancy in Pregnancy

Four deaths in our series were caused by malignancy. In some recent hospital maternal mortality reports, malignancy complicating pregnancy occupies a prominent place as a cause of death. In some instances it is due to the association of the obstetrical hospital with a cancer hospital, and the larger incidence of admissions of cancer problems related to pregnancy.

One patient, nineteen weeks pregnant, died of metastatic carcinoma of the lungs and mediastinum, five years after mastectomy for carcinoma of the

TABLE V. HEMORRHAGE

CASE NUMBER	PAST HISTORY	ANTEPARTUM AND INTRAPARTUM COMPLICATIONS	POSTPARTUM COMPLICATIONS	POST MORTEM	PREVENTABLE FACTORS
1. 1944 Age 31 Gravida ii Para i 28 weeks	1 year previously cesarean section for toxemia.	Admitted at 25 weeks for bleeding. After 19 days, cesarean section for central placenta previa. Placenta adherent. 800 c.c. blood loss. Supracervical hysterectomy for this. 500 c.c. transfusion. 250 c.c. plasma.	Severe hemorrhage 1 hour postpartum and died before adequate therapy. Portion of uterus with partial placenta accreta not removed at hysterectomy.	Yes. 500 c.c. blood in vagina. Anemia of all organs.	Preventable.
2. 1945 Age 37 Gravida v Para iii 29 weeks	1. Spontaneous abortion 2. Cesarean section, placenta previa 3. Cesarean section for previous cesarean section 4. Cesarean section for abruption	Spotting through pregnancy. Hospitalized at 27 weeks for bleeding. Cesarean section for central placenta previa at 29 weeks. Blood loss 750 c.c. Transfusion 1,900 c.c., plasma 750 c.c.	Because of old adhesions (previous classical cesarean section) unable to do a rapid hysterectomy for bleeding at operation. Bleeding and shock at operation. Died 2 hours postoperatively.	None	Not preventable.
3. 1949 Age 24 Gravida v Para iv 21 weeks Clinic	Noncontributory	Admitted at 20 weeks for anemia. Transfused. Abdominal pain. Operation for "ovarian cyst."	Placenta adherent to and eroded into left common iliac vein. Exsanguinating hemorrhage, 1,000 c.c. Transfused but died in 5 minutes.	Placenta erosion through left common-iliac vein.	Not preventable.

breast. The second woman died of metastatic melanosarcoma of the scalp at thirty-one weeks' gestation. There was one instance of malignant chorio-carcinoma following a normal spontaneous delivery. This patient died twenty weeks post partum. The fourth was caused by acute myelogenous leukemia.

Hemorrhage

There were 3 deaths from hemorrhage from 1944 through 1950 in 56,456 live births compared with 18 in the previous 66,376 live births. One of the 3 was preventable, 2 probably not preventable. Only one death has occurred since the establishment of the hospital blood bank and the always-present 1,000 c.c. of Rh-negative processed blood.

The woman who died in 1945 had had three previous classical cesarean sections in other hospitals. At the time of the fourth cesarean section for central placenta previa, the peritoneal surface of the uterus was so adherent to the parietal peritoneum that it was impossible to do a rapid hysterectomy for the excessive and uncontrollable bleeding at the time of cesarean section.

Despite the large number of deliveries, there have been only three instances of abdominal pregnancy in the hospital, and one of these patients died of hemorrhage on the operating table in 1949. Postmortem exploration revealed the placenta adherent to and eroding the left common-iliac vein. This has been the only death from hemorrhage in over 50,000 deliveries in the last six years—1946 through 1951.

Intestinal Obstruction

There were two preventable deaths at the Margaret Hague Maternity Hospital from intestinal obstruction, one in 1944 and one in 1948. Three others had occurred before 1944. This is an infrequent complication, but too often in pregnancy the diagnosis is delayed or unrecognized. When this happens, the maternal and fetal mortality is high.

Any cause present in a nonpregnant person may be a factor, but post-operative (appendectomy or myomectomy) fibrous adhesions are the most frequent etiological factors. In a pregnant woman, especially with an abdominal-wall scar, and with cramplike pain and vomiting, obstruction should be suspected until it can be ruled out with certainty.

Conclusions

Fifty-six maternal deaths are presented from a County Maternity Hospital which occurred in relation to 56,456 live births, from January, 1944, through December, 1950. There have been no corrections and no exclusions. This hospital has an Obstetrical Staff and a large Courtesy Staff of physicians. The patients include clinic, nonclinic, semiprivate, and private. No patient is refused admission or readmission.

As in some other large obstetrical hospitals, in recent years, deaths from rheumatic heart disease complicated by pregnancy head the list. In these, a past history of failure or a change in the functional capacity of the heart

during the pregnancy have not been seriously enough appreciated. In some, evidences of increasing failure during the pregnancy have not been diagnosed or have been ignored. The pregnant woman with rheumatic heart disease, who is a Cardiac Clinic patient and who cooperates fully with the management of her problem, fares better than the private patient.

Although the incidence of eclampsia has decreased, the maternal mortality in our experience remains high—10 per cent.

Several of the cases classified under deaths from embolism may have been preventable.

Even with blood banks and the access to Rh-negative processed blood, deaths from hemorrhage in a large obstetrical service will occasionally occur. Because of the unpredictable circumstances of sudden and very serious blood loss in obstetrics, unless all of the measures to combat this are constantly at hand for prompt, adequate, and rapid replacement, a death may occur that otherwise could have been prevented.

Dr. Peter Beaugard, Chief Resident at the Margaret Hague Maternity Hospital at the time this report was prepared, was of great assistance in reviewing the charts and preparing the tables.

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CESAREAN SECTION IN A SMALL URBAN HOSPITAL 1944 TO 1951*

BERNARD SCHNEIDER, M.D., LOUISVILLE, KY.

(From the Department of Obstetrics and Gynecology, Jewish Hospital)

THE expanding indications for cesarean section in recent years have heralded a new epoch in the history of the operation. Prior to 1500[1] the operation was occasionally performed post mortem in the hope of saving the child. From 1500 to 1800[1] the technique was extremely crude and anesthesia was unknown. The uterine wound was not closed, asepsis was unrecognized, procrastination was great, and maternal mortality was forbiddingly high.

Throughout most of the nineteenth century the high maternal and infant mortality associated with the use of high forceps focused attention on cesarean section as a means of avoiding such discouraging results. Procrastination contributed to a high cesarean mortality in this period, however.

In 1876 the introduction of the Porro operation marked the first major step in the development of a sound theory of cesarean section technique. This reduced the mortality from the dreaded sepsis and peritonitis. Several years later, in 1882, Sanger[1] introduced a new technique which prevented hemorrhage and the leakage of lochia into the peritoneal cavity and became popularly known as the classical cesarean section. His teachings resulted in an appreciable reduction in maternal morbidity and mortality.

The next major advance in cesarean technique was the use of cervical or lower segment operations, including extraperitoneal techniques. (It is of historical interest to note that the first to suggest a low incision was Johnson[1] in 1769.) In 1906 and 1907 Frank[1] performed thirteen lower segment operations with no maternal deaths. This method was adopted by many operators and modified in many ways. In 1908 Latzko[1] described his technique of extraperitoneal cesarean section. In 1912 Kronig[1] showed that better results were obtained with the technique now known as the low cervical cesarean section. Subsequent experience has shown that this was a safe operation in advanced labor, and that there was a lower incidence of ruptured uterine scars than after classical operations. Kronig's technique was popularized in this country by Beck and DeLee.[1]

Since the end of World War II, a marked broadening of the indications for cesarean section has occurred. There are many new additions to our armamentarium, available only in recent years. They have contributed to the safety of the operation to the degree that some series of cases have been reported in which the maternal mortality is considerably less than 1 per cent. These factors have thus made it possible to employ the operation in situations in which the procedure previously was contraindicated.

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Material

This report covers eight years, 1944 through 1951. The Jewish Hospital is a 100 bed general hospital in an urban community of approximately half a million population.

TABLE I

	DELIVERIES	CESAREAN SECTIONS	CESAREAN INCIDENCE (PER CENT)
1944	425	11	2.6
1945	436	14	3.21
1946	535	30	5.6
1947	514	33	6.42
1948	490	39	7.96
1949	552	47	8.51
1950	532	56	10.5
1951	690	38	5.51
Total	4,174	268	6.42

Table I reveals that there were 4,174 deliveries, 268 by cesarean section, an incidence of 6.42 per cent. The annual incidence increased from 2.6 per cent in 1944 to 10.5 per cent in 1950, followed by a drop to 5.51 per cent in 1951, when consultation with a physician recognized by the hospital as competent in the clinical field of the provisional diagnosis became a requirement.

A review of the records of these 268 cases of cesarean section revealed that in many of them much important evidence had not been recorded. In view of the limitations imposed by the meager evidence, it is recognized that justifiable indications actually may have been present, though not made a matter of record. The need for greater attention to recording pertinent data is, therefore, apparent.

An attempt has been made to classify the validity of the indications through evaluation of such data as were available.

It is believed that as critical a review as possible would be of benefit in evaluating the indications and of value to other institutions confronted with the rising cesarean incidence.

TABLE II. INDICATIONS

INDICATIONS	NUMBER OF CASES	PERCENTAGE OF SECTIONS	STERILIZATIONS
Cephalopelvic disproportion	71	26.5	8
Repeat section	53	19.8	36
Cervical dystocia and/or uterine inertia	42	15.7	11
Not stated	18	6.7	6
Toxemia	16	6.0	4
Placenta previa	13	4.9	5
Abruptio placentae	8	3.0	3
Elderly primipara	6	2.2	2
Varicosities of vulva and vagina	5	1.9	3
For sterilization	4	1.5	4
Breech presentation	3	1.1	
Fibromyomas of the uterus	3	1.1	
Miscellaneous Group I	16	5.9	8
Miscellaneous Group II	10	3.7	4
Total	268	100.0	94

Indications

Table II reveals that there have been 71 cesarean sections for cephalopelvic disproportion, 53 repeat sections, 42 sections for cervical dystocia and/

or uterine inertia, 18 in which the indication was not recorded, 16 for toxemia of pregnancy, 13 for placenta previa, 8 for abruptio placentae, 6 for elderly primiparity, 5 for varicosities of the vulva and vagina, 4 for sterilization, 3 for breech presentation, 3 for fibromyomas of the uterus, and 26 for miscellaneous indications.

1. Cephalopelvic Disproportion (Seventy-One Cases).—

Fifty-four patients were delivered at full term, 3 prematurely, and in 14 cases the term of pregnancy was not recorded. Thirty-four were para 0, 10 were multiparas, and the parity of 27 was not stated. No age group predominated.

In 45 cases, all primary cesarean sections, evidence of labor was not recorded. The patients were admitted one afternoon and sectioned the following morning, or within a few hours, apparently electively. Five patients had ruptured membranes. In the 26 cases with some labor, this varied widely from mild contractions for a few hours to what might be termed an adequate test of labor. In 5 cases of this group with some labor, evidence indicated that membranes had been ruptured artificially or spontaneously.

The preoperative pelvic examination and the obstetrical history were seldom recorded and in these instances the data were limited and nondescript.

A report of x-ray examination was recorded in 8 cases, in 5 of which the opinion was expressed that there was borderline to actual disproportion. The findings in the remaining 3 cases were not considered roentgenologically evident of disproportion.

Analysis of the fetal weights disclosed that in more than 50 per cent of these cases, the babies weighed less than 8 pounds, and in almost one-third less than 7 pounds. There was one set of twins.

A larger proportion of these patients should have received an adequate test of labor, in addition to more thorough physical examinations and more frequent x-ray evaluation.

Hunt,[2] Greenhill,[3] and others[4, 5] have discussed and defined trial and test of labor. Cron[4] was certain that there would be fewer sections and just as many live babies if more pregnant mothers were given a fair test of labor. Sunde[5] stated that the cephalopelvic relationship has to be established functionally, not merely anatomically.

Hunt[2] stated that there is no better way to justify an initial cesarean section than by a failed test of labor and considered the triad of fetal size, uterine inertia, and contracted pelvis as the chief factors in success or failure, with the latter factor being exaggerated at the expense of the other two.

McCormick[6] has called attention to the possibly erroneous interpretation of the x-ray examination, resulting in an unnecessary rise in the incidence of cesarean section.

Plass[7] stated that in many instances the validity of the diagnosis of contracted pelvis is in considerable doubt, and if this doubt could be substantiated, it would patently invalidate the indications for the operation.

Harris and associates[8] have advocated cesarean section in any labor which threatened to be traumatic or protracted, and proposed that there should be only two types of deliveries, normal vaginal delivery including elective low forceps, and cesarean section.

2. Repeat Cesarean Section (Fifty-Three Cases).—

Thirty-seven patients were delivered at full term. In 13 cases the period of gestation was not recorded. Three patients were delivered prematurely with no data recorded concerning the need for intervention. In 9 cases with some labor, 7 were in mild labor three hours or less, and one in mild labor for

nine hours. One patient was in good labor eight hours with 4 cm. cervical dilatation and the head at midpelvis. Evidence was not recorded as to the necessity for proceeding with abdominal delivery. In the one case with ruptured membranes, evidence of labor was not recorded.

Thirty-six of these patients were sterilized by tubal ligation.

Seven babies weighed less than 6 pounds and no neonatal deaths occurred.

McCausland[9] recommended permitting patients who have had a previous section to go into labor and then operating, since it would give the baby a better chance, nearer term.

Landesman[10] has found that fetal risk in repeat cesarean section is greater than in cases of cephalopelvic disproportion, due to miscalculated prematurity, general anesthesia, and uterine rupture.

Schmitz and associates[11-12] and others[13] have reported on vaginal delivery following cesarean section. In this hospital the practice is generally unanimous that "once a section, always a section."

In patients subjected to repeat sections it is essential that more be allowed to progress further in pregnancy to obtain larger and more mature babies, that preoperative x-ray examinations be done to determine fetal age, and, when possible, the presence of a congenitally anomalous fetus.

3. Uterine Inertia and/or Cervical Dystocia (Forty-Two Cases).—

Twenty-six patients were delivered at full term. The period of gestation was not recorded in 16 instances. There were 23 nulliparas, 14 multiparas, and in 5 cases the parity was not recorded. Thirty-three patients were under 30 years of age, and 9 older.

In reviewing the data recorded concerning labor in 27 patients, only 3, whose membranes were ruptured, were found with more than twenty-four hours of labor. Of the remaining 24, 3 were in labor less than six hours, 5 from six to twelve hours, 10 from twelve to eighteen hours, and 6 from eighteen to twenty-four hours. Eight had ruptured membranes either spontaneously or artificially, one for induction initially.

There were 15 patients in this group who were not in labor, as no evidence was recorded indicating the presence of labor. Ten had ruptured membranes, one for induction. Evidence regarding the history or pelvic examination was practically negligible in the group as a whole.

In considering the usual therapy of such cases, 7 received no therapy, 3 of whom were apparently admitted for elective cesarean section. Thirteen patients were given only sedatives. Eight patients received Pituitrin or Pitocin only. Sedation and intravenous fluids were administered to one, Pituitrin and intravenous fluids to one, Pituitrin and sedation to 8, Pituitrin, sedation, and intravenous fluids to 2, and intravenous dilute Pitocin to 2 patients. In the latter, the infusion was inadequately employed. In the other cases, therapy was only partially satisfactory.

X-ray examination was recorded in 2 cases. One report revealed breech presentation and no disproportion was anticipated; the second revealed face presentation, floating, and no disproportion was anticipated.

Five babies in this group weighed less than 5 pounds, 31 from 5 to 8 pounds, and 5 over 8 pounds. The weight of one infant was not recorded.

There were 3 neonatal deaths, an incidence of 7.14 per cent for this indication.

Uterine inertia and/or cervical dystocia in this discussion has been assumed to be synonymous with uterine atony, incoordinate uterine action, positional dystocia, and so forth, which are usually associated with prolonged labor. Various criteria have been presented[14-20, 28-35] regarding the definition and methods of management of prolonged labor.

Greenhill,[14] Willson and Alesbury,[15] and Calkins[16] have discussed criteria for determination of the presence of mature gestation, evaluation of uterine activity, and progression of labor.

Starr,[17] Winterringer,[18] and others[19-20] have defined the onset of labor. Willson and Alesbury[15] allowed labor to continue as long as mother and fetus were in good condition.

McCormick[21] allowed labor to continue just long enough to learn what the patient could accomplish, not what she could endure. Douglas and Stander[22] have demonstrated the hazards associated with prolonged labor. Similar findings have been reported by Reid,[23] Eastman,[24] and others.[15, 17-20, 25-27] Winterringer[18] and Greenhill[36] have emphasized that because of the extremely poor results in labors that last longer than fifty hours, labor should be interrupted at least by that time. Starr[17] reported an uncorrected fetal mortality of 12 per cent in patients in labor thirty or more hours, which represented 46.6 per cent of the total uncorrected fetal mortality in his series of 404 cases of prolonged labor.

Reid,[23] Eastman,[24] Simon,[37] Theobald and associates,[38] Stone,[39] the Johns Hopkins group,[40] and others[41-42] have reported favorably on the use of posterior pituitary extract in the management of this problem. Gordon[42] has shown a reduction in the incidence of cesarean section for uterine inertia.

Rucker[43] stated that if the child delivered per vaginam, even if there was great difficulty, the next labor was more than likely to end in a spontaneous delivery. Schwarz and Woolf[44] found that cervical conization does not seem to contribute to cervical dystocia. Greenhill[45] stated that true cervical dystocia was rare. Evidence in this series is not available to support the diagnosis of cervical dystocia. All cases with this diagnosis were included in this group.

Traylor and Torpin[46] found that labor lasted longer in patients with 11 Gm. of hemoglobin or less. Calkins[47] reported that occiput posterior occurred almost as frequently as occiput anterior, and the only difference was a few minutes in the duration of the second stage.

In my opinion, all patients should be conducted through a definite course when labor is imminent or in progress. First, what is the period of gestation? Second, is the patient in true labor and, if so, what is the character of uterine activity? Third, what are the maternal and fetal factors initially and what changes are observed at regular intervals? In the primipara, I believe reevaluation should be made at least every eight hours and in multiparas every four hours. Fourth, therapy to avoid prolonged labor should be instituted promptly and vigorously when indicated, consideration being given to bowel and bladder, physical condition of patient and fetus, with particular consideration of the obstetric factors, sedation, hydration, nutrition, prevention or treatment of infection, morale of patient, family, and physician, condition of the membranes, stimulation of labor, and decision on the method of its termination. This regimen would tend to provide earlier attention and care to the many factors to be considered, and would avoid labors exceeding thirty hours in which the maternal and fetal morbidity and mortality are decidedly greater.

4. Indications Not Stated (Eighteen Cases).—

Evidence was not recorded in 18 instances as to the indications for cesarean section. No effort was made to establish, post hoc, what the actual indication may have been.

Data regarding parity and term of pregnancy were very limited. Fifteen patients were under 35 years of age and 3 older. There was no evidence of labor in 11 cases and the membranes were intact in 15. History and pelvic examination were of no value in interpretation.

X-ray reports were available in 3 instances. In one patient, para i, aged 33, not in labor, with membranes intact, the report revealed a molded head with small space between the head and pelvis. The baby weighed 8 pounds. In the second patient, para i, aged 21, membranes intact, there was evidence of mild contractions for several hours. The report revealed no disproportion. The baby weighed 6 pounds, 6 ounces. In the third case, para 0, aged 25, with membranes intact, there was evidence of mild labor for eight hours and cervical dilatation of 2 cm. The x-ray report revealed a narrow conjugate and large fetal head. The baby weighed 7 pounds, 15 ounces.

Only one baby weighed less than 5 pounds and there were no fetal losses.

A better example could not be presented to illustrate the importance of recorded clinical data. The memory of attendants in these cases would be severely taxed in any case of litigation. Furthermore, these cases are of no positive value in a clinical investigation nor have the records afforded any aid or comfort to the patient or physician in later obstetrical care.

5. Toxemia of Pregnancy (Sixteen Cases).—

The period of gestation was not recorded in 5 cases, was full term in 8, and premature in 3. Parity was not indicated in 9 cases. Five patients were para 0, one para i, and one para iii. Thirteen patients were under 30 years of age and 3 older.

Evidence of labor was not recorded in any of these cases and the membranes were intact on admission with no evidence to indicate rupture later. Obstetric history and pelvic examination were recorded to a practically negligible degree.

In 10 patients the blood pressure was elevated, the least being 148/90. In this case the urine contained no protein. The 9 remaining cases with hypertension had proteinuria of various degrees. One patient had blood pressure of 124/84 and no proteinuria. In the 5 remaining cases, blood pressure was not recorded, urinalysis was not recorded in 4, and in one proteinuria was present.

In classifying these cases, 4 were designated as pre-eclampsia, one eclampsia, one nephritic toxemia, and the 10 remaining merely as toxemia of pregnancy.

Management of these cases, according to available evidence, included salt-free diet, sedation, bed rest, careful blood pressure observation in most, catharsis, enemas, and intravenous glucose. Urinalyses were qualitative and recorded irregularly, in some cases only once, and in 4 not at all. Pelvic examinations were not recorded in most instances, there being no evidence of labor or ruptured membranes. These findings and more evidence of response to treatment would be of great interest in determining the propriety of cesarean section. Hunt[2] expressed the wise and charitable adage that a physician can never be too critical of the conduct of an individual delivery unless he is present. In this small group of patients, this adage may be applied.

6. Placenta Previa (Thirteen Cases).—

Six patients were delivered prematurely, 4 at term and in 3 the period of gestation was not stated. Parity was not stated in 4 cases, in 4 the patients were para 0, one each para i, para ii, and para ix, and 2 para iii. Seven patients were under 30 years of age and six between 30 and 40 years of age.

Ten patients were not in labor, one of whom had ruptured membranes. In the latter the cervix was thick, soft, and dilated 2 cm., with the presenting part high. Three patients were in labor. One patient had mild contractions for eight hours, the cervix dilated 5 cm. and the head not engaged. In the second case, the patient was in mild labor for two hours. There was no report of pelvic findings. In the third case, labor was mild for four hours, the cervix 3 cm. dilated and thick, and the placenta was palpated. Its location was not specified.

In 12 cases no evidence was recorded indicating that membranes, intact on admission, had ruptured spontaneously or artificially later.

Evidence of pelvic examination was not recorded in 5 cases. In 2 cases the cervix was closed and the placenta palpated above the cervix. In 3 cases the cervix was dilated 2 to 3 cm. and the placenta was palpated partially covering the internal os or on the margin. In 3 cases, cervical dilatation was recorded as 2 to 5 cm. and no mention was made of the location of the placenta.

The operative record of only 3 patients confirmed the preoperative diagnosis. In a fourth case the preoperative diagnosis was central placenta previa and the operative report stated that the placenta was "in the lower segment."

None of the patients in this group were in shock apparently, as no evidence of this is recorded. Apparently blood replacement was made in each case as required.

Only 2 patients in this group may be considered as having been managed conservatively. Eight patients were observed for one to eight hours, and 3 from nine to fifteen hours between admission and operation.

Conservative management of placenta previa as proposed by Johnson,[48-49] Macafee,[50-51] Stallworthy,[52] and others[53-57] has resulted in a reduction in maternal and fetal mortality and there have been fewer cesarean sections.

The opinions of these authors agree that in cases of profuse or persistent hemorrhage there can be no choice. Abdominal delivery, with due regard to blood replacement and attention to Rh compatibility, must be performed with the least practicable delay.

Greenhill[58] emphasized the value of speculum examination of the vagina and cervix, preparation for any emergency, blood replacement, and an x-ray examination to rule out monstrosities and locate the placenta.

In so far as vaginal and cervical inspection is concerned, there is general agreement. Gordon and Rosenthal[55] interdicted other examinations and pointed out that vaginal examination may fail in diagnosis if the cervix has not been sufficiently taken up.

Stallworthy[52] condemned digital examination and those classifications of placenta previa which demand this dangerous practice. Macafee[50] recommended postponing the vaginal examination to nearer term. Johnson[49] reported that careful vaginal examination permitted a reasonably accurate diagnosis to be made.

Paalman and Hunt[59] emphasized the importance of thrombosis and thrombophlebitis as complications which contribute considerably to the maternal morbidity in cases of placenta previa and also reported that the incidence of monstrosities was 5 per cent.

Stevenson,[60] Abolius,[61] Stallworthy,[52] and many others have re-emphasized the value of roentgenologic studies of patients with antepartum hemorrhage. Fetal monstrosities may be demonstrated. Greenhill[30] stated that about one-half the deformities may be recognized as they involve the skeleton or skull. Various reports have shown a very high rate of accuracy in localization of the placenta.

Conservative management of antepartum bleeding may be summarized as follows: (1) hospitalization of all bleeding patients at once, placing them on bed rest until diagnosis is made, discharging those in whom a dangerous situation is ruled out, continuing the hospitalization of those with placenta previa; (2) immediate termination of pregnancy in patients with profuse or persistent hemorrhage or premature labor; (3) radiological evaluation of all cases; (4) replacement of blood, not only initially, but re-evaluation of each case following recurring, intermittent bouts of bleeding; (5) inspection of the vagina and cervix; (6) examination of such patients only in an operating room equipped and prepared for any emergency; (7) abdominal delivery of all pa-

tients with central or partial placenta previa or with a posterior low-lying placenta when the decision is made to terminate expectant management; in patients with an anterior low-lying placenta, the membranes should be ruptured; (8) carrying of patients to the thirty-eighth week of gestation in order to obtain more mature babies; (9) no stimulation of labor (the physician should stay with the patient during labor and until she has delivered and is out of danger); (10) avoidance of any manipulative procedures such as bag insertion, version and extraction, Hicks' version and vaginal packing.

7. Premature Separation of the Normally Implanted Placenta (Eight Cases).—

In 4 cases the term of gestation was not stated. One of the remaining patients was at seven months' gestation, 2 at eight months, and one patient's gestation was "premature" with no estimate of the term.

One patient was para 0, 2 para i, one para iii, one para iv, and the parity of 3 patients was not recorded.

Five patients were in the third decade of life and 3 in the fourth.

Evidence of labor was not recorded in 5 cases. In the remaining 3 cases, the only patient with ruptured membranes was in mild labor two hours, one had fair contractions for twelve hours with a bloody discharge, effaced cervix dilated to 2 cm., and the head at midpelvis, and one patient had mild contractions for four hours.

Significant history and physical findings were not recorded. The fetal heart tones were not heard in 2 cases, were satisfactory in 4, and in 2 cases no evidence was recorded.

No x-ray studies were recorded in these cases.

Operative reports revealed little or no evidence concerning the uterine contents. One report showed the placental site to be on the anterior wall of the uterus.

Blood counts preoperatively were recorded in 5 cases, 4 of which revealed anemia. All 8 patients were given blood transfusions. Blood pressure on admission was recorded in 7 cases. The levels were within normal range in 5, in one of which the blood pressure was recorded about twenty-four hours later as 60/20 (two hours before section). The blood pressure on admission in another case was 80/48. In the seventh case the blood pressure on admission was 142/104, and in this case no record is available of preoperative urinalysis. In only 2 cases was there such a record. One presented no abnormal findings and in the other there was a trace of protein. Except for the previously mentioned instances of blood pressure elevation and proteinuria, evidence of toxemia was not recorded in any of these cases.

Six patients were sectioned one to four hours, one twelve hours, and one thirty hours after admission.

Conservative management of antepartum bleeding has been mentioned in the foregoing discussion of placenta previa. The work of Sexton and associates[62] has revealed that in case of abruptio placentae cesarean section did not insure a living infant.

Bartholomew and colleagues[63] reported that the severity of abruptio parallels not only the coexistence, but particularly the severity of the toxemia.

McCain and Poliakoff[64] reported conservative management of premature separation of the normally implanted placenta over a period of twenty years. The uncorrected maternal mortality was 4.8 per cent. The infant mortality of the premature and term deliveries was 60.2 per cent.

McCormick[65] stated that undoubtedly it is startling to most physicians to hear it proclaimed that, regardless of the severity of the mother's condition or the viability of the fetus, and barring other obstetric indications, all cases can be managed best by conservative measures.

Rucker[66] stated that no one would advocate cesarean section for those with mild or moderate types of premature separation.

Kimbrough and Jones[67] have recommended increased vigilance in mild cases and as prompt evacuation of the uterus as is compatible with safety in the more severe cases.

Bysshe[68] has reported that of infants delivered abdominally, 45.4 per cent were lost. Of those delivered vaginally, 34.1 per cent were lost.

8. Elderly Primipara (Six Cases).—

There was one case in which the term of gestation was not recorded. Four were recorded as full-term gestations and one postmature. In the latter, the term of gestation was recorded as "two weeks past term."

All patients were over 35 years of age. None of these patients was in labor and only one had ruptured membranes.

In one case there was a statement to the effect that the patient had been infertile for 18 years. Otherwise, no evidence was available concerning the history or physical findings in these cases. No x-ray studies were recorded.

In addition to this group of 6 cases, elderly primiparity was given as a secondary indication in 3 cases included in the group delivered because of cephalopelvic disproportion.

Recent reports[69-74] have emphasized that in this group of patients there are more medical and surgical problems.

Calkins[74] has reported that labor and its results can be expected to progress along the same lines in both primiparas and multiparas in the older age groups. Hawkins and associates[72] recommended that each case be individualized for an uneventful vaginal delivery was most likely. Randall and Taylor[69] reported a cesarean section incidence of 12.8 per cent and recommended that the indications be carefully considered and individualized.

Cron[4] considered cesarean section for the delivery of the elderly primipara as a much overworked indication.

Greenhill[30] has stated that primigravidity in advanced years should be a factor influencing the indications for cesarean section, when it is associated with some factor that is a borderline indication for operative intervention. He also recommended that in old primigravidas more importance should be attached to the baby than in younger women, particularly if the elderly primigravida has been sterile for many years or has had repeated abortions.

9. Varicosities of the Vulva and Vagina (Five Cases).—

Varicosities of the vulva and vagina of a degree sufficient to require abdominal delivery must be very rare indeed. It is extremely difficult to conceive of these varicosities not being accompanied by varicosities of the broad ligaments. Furthermore, since thrombophlebitis is not an unlikely complication with varicosities, can we justify cesarean section except in the rarest cases where the vaginal vault may be honeycombed with varicosities?

10. For Sterilization (Four Cases).—

Three of the patients were recorded as being at full-term gestation and the term of gestation of the fourth was not recorded. One patient was para i, one para ii, and the parity of 2 was not stated. Their ages varied from 24 to 40 years.

One patient was admitted with ruptured membranes, in mild labor, and with the cervix soft, thin, and 6 cm. dilated. The other 3 patients were not in labor and in 2 of these there was no evidence that membranes, intact on admission, had ruptured. In one case the condition of the membranes was not recorded. For the most part, the history and physical findings were not recorded.

Dieckmann[75] has stated that tubal ligation per se is not an indication for cesarean section.

Cron[4] considered cesarean section in order to sterilize the mother by resection of the Fallopian tubes never to be justifiable.

Plass[7] stated that cesarean section in order to carry out sterilization is inexcusable when the identical tubal procedure can be performed shortly after vaginal delivery with minimal risk.

11. Breech Presentation (Three Cases).—

The term of gestation was not recorded in one case, was full term in one, and eight months in the third. All were young primigravidas.

One patient was 18 years of age, one 23, and one 29. None was in labor and one had ruptured membranes. In the latter case the cervix was thick, uneffaced, and 1 cm. dilated, with the breech floating. X-ray examination in this case confirmed breech presentation but no other data were recorded. A second x-ray report revealed no physical disproportion (patient 18 years of age). No other physical findings or history were recorded.

Breech presentation was mentioned as a secondary indication 10 times. Nine cases were associated with cephalopelvic disproportion and one with toxemia of pregnancy. Five of these were in primigravidas.

It is obvious that the management of breech presentation in this hospital has been almost entirely per vaginam even though these 3 patients were rather young not to have been so delivered.

12. Fibromyomas of the Uterus (Three Cases).—

The term of gestation was full term in one case, seven and one-half months in the second case, and was not recorded in the third case.

One patient was para 0. The parity was not recorded in 2 instances.

Ages recorded were 27, 32, and 35 years.

All cases were elective as there was no evidence of labor or ruptured membranes. History and physical findings were not recorded.

The operative reports in 2 cases revealed no evidence regarding the site of the fibroids. In the third case, the operative report stated: ". . . fibroids occupied approximately two thirds of the entire structure" of the uterus. In this case the pathologic examination of the excised uterus revealed the presence of a single fibroid, 18 cm. in diameter, with areas of hemorrhage and necrosis. Another pathologic examination revealed two small seedling myomas, 1 cm. in diameter, in the excised uterus. In the case with myomectomy the pathologic examination revealed the presence of one nodule 3 cm. in diameter and one nodule 2 cm. in diameter. Carneous degeneration was observed in these nodules.

There is considerable variation of opinion as to the management of fibroids associated with pregnancy.[76-83]

Greenhill[30] has written that myomectomy performed before or even during pregnancy with retention of the gestation is not necessarily an indication for cesarean section because in most instances this surgical wound heals perfectly and that, contrary to what may occur after a cesarean section, rupture of a uterus following myomectomy is extremely unusual. He stated that abortion and premature labor occur in a fair proportion of patients after myomectomy. However, he continued, even if this does take place, the patient is better off because she may conceive again and will most likely carry the gestation to term.

13. Miscellaneous Groups I and II (Twenty-six Cases).—

These groups are composed of a heterogeneous mixture of indications. Group I includes 16 cases each with a different indication. Group II includes 10 cases, 2 for each of five indications.

Some of the cases in these groups may have been properly included with indications previously presented. Data were not available, however, to permit a more critical classification.

Group II included these indications: (1) previous vaginal plastic surgery; (2) postmaturity; (3) request of family; (4) previous difficult delivery; (5) previous myomectomy. Previous vaginal surgery may be considered a reasonable indication in the occasional case. With such limited information as was available, however, justification for the remaining cases is open to question.

Group I included these indications: (1) transverse presentation; (2) posterior position; (3) twins with possible locked heads; (4) cervix not dilated; (5) elderly patient with hard cervix; (6) previous long labor with cervical lacerations; (7) previous Dührssen's incisions; (8) double vagina; (9) severe varicosities (site not stated); (10) large baby; (11) Rh-negative mother; (12) hysteria; (13) sacroiliac disease; (14) severe diabetes; (15) heart disease; (16) umbilical hernia. There can be little disagreement as to the validity of some of these indications. A few others were undoubtedly justifiable except for the wording of the indication. The majority of these cases are open to question, however, if the indication given was the sole factor leading to intervention.

Evidence of labor was not accorded in 24 cases and there was no evidence that membranes, intact on admission in 25 cases, had ruptured later. In the case of transverse presentation, membranes had ruptured prior to admission and the patient was in mild labor for ten hours. In the case of severe diabetes, the term of gestation was seven and one-half months and the patient was in active labor six hours.

Roentgenologic studies were reported in 5 cases. No disproportion was anticipated in the case of transverse presentation and the case of posterior position. In the case of twins with possible locked heads, it was reported that one head was in the right lower quadrant and the other head in the left upper quadrant. In one of the cases sectioned on "request of family" the report stated that there was questionable disproportion. In one of the cases sectioned for postmaturity, the report stated that there was no engagement.

Surgical Information

The type of operation was not recorded in 174 instances. It is assumed from information obtained by personal contact that almost all of these were of the classical type. The latter type was recorded in 42 instances. In 52 cases the type of operation was low cervical.

Sterilization by tubal ligation was performed in 94 cases (35.1 per cent) (Table II). Indications for this procedure were not recorded.

Five hysterectomies were performed. One was in the case of a patient, aged 42, para viii, gravida x, with acute amniitis, who had ruptured membranes twenty-two hours, and a temperature of 101° F. Medical induction had failed. The postoperative course was afebrile and uneventful. The indication for section in this case was uterine inertia. Two patients sectioned for placenta previa had hysterectomies. In one case, the patient was observed in the sixth and early seventh month of gestation with painless vaginal bleeding. On the former occasion, the patient was discharged from the hospital with a diagnosis of placenta previa. On the second admission, cesarean section was done after ten days' further observation, supravaginal hysterectomy eight days following section, and prior to section and following section and hysterectomy multiple blood transfusions were given. Bleeding persisted and five days after hysterectomy the cervix was inspected and found to be replaced

by a large fungating, necrotic mass which on biopsy proved to be squamous-cell carcinoma which was subsequently treated by radiation. (This patient died about one year later.) In the other patient sectioned for placenta previa, hysterectomy was done because of adherent placenta and hemorrhage in the course of operation. Two hysterectomies and one myomectomy done in cases sectioned for fibromyomas of the uterus have been referred to previously.

Fifty-three patients presented evidence of postoperative morbidity, giving a morbidity rate of 19.8 per cent. Neither the pathogenesis nor the diagnosis of the morbidity was recorded.

Spinal anesthesia was used in 232 cases, general anesthesia in 34, and intravenous Pentothal Sodium in two.

The operation was performed by five obstetricians in 211 cases, by four general practitioners in 33 cases, and by ten general surgeons in 24 cases.

Maternal Mortality

There was one maternal death. This patient was 23 years of age, a primigravida at term, and was admitted with ruptured membranes. After four hours' labor she was sectioned for cephalopelvic disproportion with breech presentation. General anesthesia was used. She ran a febrile course for the first four postoperative days and was preparing to go home on the twelfth postoperative day when she suddenly died. The diagnosis was recorded as cerebral embolus. There was no postmortem examination. The type of operation was not recorded in this case.

This death was in the fourth case of the series.

Table III shows the maternal mortality in this hospital for the eight-year period covered by this report. The gross maternal mortality rate was 0.096 per cent. For cesarean section, the rate was 0.373 per cent, almost four times as great.

TABLE III. MATERNAL MORTALITY

	1944	1945	1946	1947	1948	1949	1950	1951	TOTAL
Total	2	0	0	0	0	0	0	2	4
Cesarean section deaths	1	0	0	0	0	0	0	0	1
Gross maternal mortality rate (per cent)	0.47	0	0	0	0	0	0	0.29	0.096
Cesarean section maternal mortality rate (per cent)	9.1	0	0	0	0	0	0	0	0.373

Fetal Loss

Table IV shows the fetal loss in all deliveries for the eight-year period covered by this report. The gross fetal loss rate was 3.69 per cent.

TABLE IV. FETAL LOSS

	1944	1945	1946	1947	1948	1949	1950	1951	TOTAL
Births*	425	436	535	514	490	552	532	690	4,174
Stillbirths	4	8	11	3	12	7	4	11	60
rate (per cent)	0.94	1.83	2.06	0.58	2.45	1.27	0.75	1.59	1.44
Neonatal deaths	5	12	4	12	12	10	16	23	94
rate (per cent)	1.18	2.75	0.75	2.33	2.45	1.81	3.01	3.33	2.25
Total fetal loss	9	20	15	15	24	17	20	34	154
Gross fetal loss (per cent)	2.1	4.6	2.8	2.9	4.9	3.1	3.76	4.93	3.69

*Total multiple births unknown.

Table V shows the fetal loss in cesarean section. This rate was 5.51 per cent.

TABLE V. CESAREAN SECTION FETAL LOSS

	1944	1945	1946	1947	1948	1949	1950	1951	TOTAL
Total cesarean sections	11	14	30	33	39	47	56	38	268
Total births by cesarean section	11	14	30	34	40	49	56	38	272
Cesarean stillbirths	0	0	0	1	0	1	0	2	4
Rate (per cent)	0	0	0	2.95	0	2.04	0	5.26	1.47
Cesarean neonatal deaths	0	0	1	3	3	1	3	0	11
Rate (per cent)	0	0	3.33	8.83	7.5	2.04	5.36	0	4.04
Cesarean gross fetal loss (per cent)	0	0	3.33	11.77	7.5	4.08	5.36	5.26	5.51

TABLE VI. SUMMARY OF FETAL LOSSES IN CESAREAN SECTION

INDICATION	TERM OF GESTATION	WEIGHT	RESULT	CAUSE OF DEATH
Abruptio placentae	Term	?	Stillbirth	Abruptio placentae
Abruptio placentae	8 months	?	Stillbirth	Abruptio placentae
Cervix not dilated	Term	?	Stillbirth	Monstrosity
For sterilization	?	?	Stillbirth	Unknown
Pre-eclampsia	7 months	4 pounds	Neonatal death	Prematurity
Eclampsia	?	?	Neonatal death	Prematurity
Nephritic toxemia	7 months	2 pounds, 10 ounces	Neonatal death	Prematurity
Uterine inertia	Term	3 pounds, 4 ounces	Neonatal death	Prematurity
Uterine inertia	?	5 pounds 13 ounces	Neonatal death	Prematurity
Uterine inertia	?	?	Neonatal death	Congenital anomalies
Placenta previa	6½ months	2 pounds, 9 ounces	Neonatal death	Prematurity
Placenta previa	30 weeks	3 pounds, 11 ounces	Neonatal death	Prematurity
Abruptio placentae	7 months	?	Neonatal death	Prematurity
Fibromyomas of the uterus	7½ months	2 pounds, 2 ounces	Neonatal death	Prematurity
Elderly primiparity	Term	6 pounds, 15 ounces	Neonatal death	Congenital anomalies

In this series of 268 cesarean sections the fetal loss was 50 per cent greater than for all deliveries.

Two stillbirths occurred in patients delivered for abruptio placentae, one at term and the other at eight months' gestation. A third, a macerated monstrosity, occurred in a patient delivered at term for the indication "cervix not dilated." The fourth, a macerated fetus, occurred in a patient at a term of gestation not stated, delivered for the indication "for sterilization."

Three neonatal deaths followed sections for each of two indications, namely, toxemia of pregnancy and uterine inertia and/or cervical dystocia. Two neonatal deaths occurred in babies delivered for placenta previa and one each in babies delivered for abruptio placentae, elderly primiparity, and fibroids. In 7 cases, the cause of death was recorded as prematurity. In the case of elderly primiparity and one case of uterine inertia, the cause of neonatal death was recorded as congenital anomalies incompatible with life.

Two neonatal deaths and one stillbirth were attributed to congenital anomalies. These and the macerated fetus may have been recognized by x-ray study.

Nine neonatal deaths were attributed to prematurity. Some of these deaths may have been preventable in the light of present knowledge. Two stillbirths associated with abruptio placentae should be considered unavoidable.

Table VI summarizes the fetal losses in 268 cesarean sections.

Fetal Weights

Considering 5½ pounds as the minimum weight for term infants; it was found that 40 cesarean infants (15 per cent) weighed less and are considered to be premature. Eighteen of these infants were delivered of mothers with toxemias of pregnancy, placenta previa, and abruptio placentae, conditions not infrequently associated with prematurity of the infant. Of the remaining 22, 8 were delivered at a recognized premature term of gestation, and 14 were apparently miscalculated as at term. The prematurity of 35 per cent of the premature infants delivered by cesarean section is therefore due to this error. One of the 14 died.

TABLE VII. VALIDITY OF INDICATIONS

INDICATION	TOTALS	JUSTIFIED	DOUBTFUL	UNJUSTIFIED	CONTRAINDICATED
Cephalopelvic disproportion	71	13*	13*	45†	
Repeat	53	53			
Cervical dystocia and/or uterine inertia	42	3‡	24	15†	
Not stated	18		18		
Toxemia	16	16			
Placenta previa	13	13			
Abruptio placentae	8	8			
Elderly primiparity	6		6		
Varicosities of vulva and vagina	5		5		
For sterilization	4				4
Breech presentation	3		3		
Fibromyomas of the uterus	3		3		
Miscellaneous I	16	2	3	9	2
Miscellaneous II	10	2		8	
Total	268	110	75	77	6

*Estimated.
†No labor.
‡Over 24 hours' labor.

Validity of Indications

In Table VII, the indications for 268 cesarean sections are classified as to their validity. One hundred ten are considered to have been justified, 75 doubtfully justified, 77 unjustified, and 6 are considered to have been contraindicated. These conclusions are obviously subject to inaccuracies because of the poor quality of medical records, as conditions may have been present substantiating the indication although not made a matter of record.

Comment

Ravdin,[84] discussing the surgeon's responsibility to modern society, stated that a deep realization of our responsibilities is necessary to all of us. I believe we are achieving this realization in our hospital. The Medical Staff has been departmentalized, consultations have been established as a requirement prior to cesarean section, and a Medical Record Committee reviews all records.

The Department of Obstetrics and Gynecology reviews all cesarean sections, sterilizations, therapeutic abortions, maternal and fetal statistics, including deaths, and any other significant problem. It also grants privileges to applicants for staff membership, in accordance with specifically established policies.

With the review being conducted by the Department of Obstetrics and Gynecology, it is anticipated that the observation of Hawks[85] will not be relevant in our hospital. Hawks[85] reported that consultations do not always safeguard as they are often merely politely agreeable.

Summary and Conclusions

1. Cesarean section has entered a new epoch of expanding indications and higher incidence.

2. Two hundred sixty-eight cesarean sections performed during a period of eight years at the Jewish Hospital were reviewed. The incidence of cesarean section was 6.42 per cent.

3. Clinical evidence was inadequately recorded and the fullest use of the entire obstetric armamentarium has not been made.

4. Indications for cesarean section were as critically reviewed as possible. One hundred ten operations were considered justified, 75 doubtfully justified, 77 unjustified, and 6 contraindicated.

5. The cesarean maternal mortality rate was 0.373 per cent, almost four times as great as the corresponding rate in all deliveries.

6. The fetal loss rate in cesarean section, 5.51 per cent, was 50 per cent greater than the corresponding rate in all deliveries. The latter has not been reduced in spite of increasing use of cesarean section.

7. Prematurity and congenital anomalies were responsible for all neonatal deaths following cesarean section in this series.

8. Thirty-five per cent of premature infants in this series of cesarean sections resulted from miscalculation of the term of gestation.

9. Lower gross maternal and fetal mortality rates should be sought to justify the increasing incidence of cesarean section.

10. The medical profession has a growing responsibility in determining the role of cesarean section in the salvage of more human lives.

11. Properly organized and directed hospital controls are important factors in the use of cesarean section.

Addendum.—In 1952 and 1953 the cesarean incidence fell to 3.91 per cent and 2.79 per cent, respectively. The gross fetal losses in these years were 4.28 per cent and 3.04, respectively. In 1953 one mother with a rapidly fulminating eclampsia died undelivered ten hours after admission. We believe the reduction in cesarean incidence and the improvement in gross fetal and maternal losses are directly related to the controls established in our hospital.

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A REVIEW OF CESAREAN SECTION STATISTICS IN A COMMUNITY AND IN THE UNITED STATES

BERNARD SCHNEIDER, M.D., LOUISVILLE, KY.

(From the Jewish Hospital)

A SURVEY[1] has been made recently of cesarean sections performed during an eight-year period in the Jewish Hospital. With the cooperation of responsible persons in the seven other hospitals which provide obstetric service to this community, comparable data have been obtained.

Reports on cesarean section have been selected at random from the literature of recent years. Comparisons were made between community and national experience and between various levels of cesarean incidence.

Community Experience

In Tables I, II, and III data are presented concerning maternal and fetal statistics of eight Louisville hospitals for periods of five to eight years as indicated.

TABLE I. MATERNAL STATISTICS, LOUISVILLE HOSPITALS

HOSPITAL	PERIOD	TOTAL DELIVERIES	TOTAL CESAREAN SECTIONS	CESAREAN SECTION RATE (%)	GROSS MATERNAL DEATHS	GROSS MATERNAL DEATH RATE (%)	CESAREAN SECTION MATERNAL DEATHS	CESAREAN SECTION MATERNAL DEATH RATE (%)
Jewish Hospital	1944-1951	4,174	268	6.42	4	0.096	1	0.373
A	1947-1951	12,287	325	2.64	6	0.049	0	0
B	1944-1951	10,804	343	3.17	10	0.093	2	0.583
C	1947-1951	10,860	567	5.22	4	0.037	1	0.176
D	1944-1951	16,421	449	2.73	18	0.109	3	0.668
E	1944-1951	9,659	557	5.77	7	0.072	3	0.539
F	1944-1951	13,384	296	2.21	14	0.105	0	0
G	1945-1951	1,525	49	3.21	4	0.262	1	2.04
Total		79,114	2,854	3.61	67	0.085	11	0.385

There have been 79,114 deliveries, 2,854 by cesarean section, resulting in a community cesarean incidence of 3.61 per cent. In all deliveries, 67 maternal deaths occurred, giving a gross maternal death rate of 0.085 per cent. Eleven maternal deaths were associated with cesarean section, resulting in a cesarean maternal mortality rate of 0.385 per cent, slightly more than four and one-half times as great as the gross maternal mortality. All hospitals vary from the community averages in cesarean incidence and both gross and cesarean maternal mortality. Two hospitals reported no cesarean maternal deaths in 325 and 296 cesarean sections and, as will be observed later, the highest fetal losses in cesarean section.

In Table II, the fetal losses in all deliveries are shown. A total of 79,743 infants were delivered (total multiple births of two hospitals are unknown).

This total includes all infants of 20 or more weeks' gestation. There were 1,332 stillbirths, giving a stillbirth rate of 1,67 per cent; 1,808 infants succumbed within 10 days of birth, giving a neonatal death rate of 2.27 per cent. The gross fetal loss was 3.140, yielding a rate of 3.94 per cent. All eight hospitals vary more or less from these community averages.

TABLE II. FETAL STATISTICS, LOUISVILLE HOSPITALS

HOSPITAL	PERIOD	TOTAL INFANTS	TOTAL STILL-BIRTHS	TOTAL STILL-BIRTH RATE (%)	TOTAL NEO-NATAL DEATHS	TOTAL NEO-NATAL DEATH RATE (%)	GROSS FETAL LOSS	GROSS FETAL LOSS RATE (%)
Jewish Hospital	1944-1951	4,174*	60	1.44	94	2.25	154	3.69
A	1947-1951	12,405	184	1.48	274	2.21	458	3.69
B	1944-1951	10,906	169	1.55	248	2.27	417	3.82
C	1947-1951	10,860*	169	1.56	208	1.92	377	3.47
D	1944-1951	16,583	242	1.46	412	2.48	654	3.94
E	1944-1951	9,728	130	1.34	164	1.69	294	3.02
F	1944-1951	13,553	323	2.38	374	2.76	697	5.14
G	1945-1951	1,534	55	3.59	34	2.22	89	5.80
Total		79,743	1,332	1.67	1,808	2.27	3,140	3.94

*Total multiple births unknown.

In Table III fetal losses associated with cesarean section at the same eight hospitals are given. Eighty-six infants were stillborn, giving a stillbirth rate of 3.01 per cent; 145 neonatal deaths were reported, giving a neonatal death rate of 5.08 per cent. The total fetal losses in cesarean section infants were 231, a rate of 8.09 per cent. This figure is more than twice as great as the gross fetal loss rate for all deliveries. The cesarean fetal loss rates of the Jewish Hospital and Hospitals C, E, and G are less than twice as great as their gross fetal loss. Hospitals B and F have rates slightly more than twice as great, Hospital D slightly more than two and one-half times as great, and Hospital A more than four times as great. Hospitals A and F reported no maternal losses in cesarean section and have the highest rates of fetal loss.

TABLE III. CESAREAN SECTION FETAL STATISTICS, LOUISVILLE HOSPITALS

HOSPITAL	TOTAL CESAREAN SECTIONS	STILL BIRTHS	STILL-BIRTH RATE (%)	NEONATAL DEATHS	NEONATAL DEATH RATE (%)	TOTAL FETAL LOSS	TOTAL FETAL LOSS RATE (%)
Jewish Hospital	268	4	1.49	11	4.10	15	5.60
A	325	22	6.77	28	8.61	50	15.38
B	343	10	2.92	17	4.96	27	7.87
C	567	8	1.41	26	4.59	34	6.00
D	449	18	4.01	28	6.24	46	10.24
E	557	7	1.26	17	3.05	24	4.31
F	296	17	5.74	17	5.74	34	11.49
G	49	0	0	1	2.04	1	2.04
Total	2,854	86	3.01	145	5.08	231	8.09

National Experience

In Table IV, 33 reports of series of cesarean sections are compiled and the Louisville statistics added to give a broad perspective of experience in the United States and Canada. This compilation is by no means all inclusive. The data, however, are those of many institutions, large and small, public and

private. No effort has been made to segregate the teaching institutions of national reputation. The most reliable and significant reports are expected from such centers. To achieve the results reported by our leading obstetrical training centers requires studious application of rigid methods, with trial and error subject to close scrutiny. Should not this scrutiny be applied in the larger and broader sense to include a variety of situations?

TABLE IV. COMPILATION OF REPORTS

AUTHOR AND REFERENCE	PERIOD OF REPORT	TOTAL DELIVERIES	CESAREAN SECTIONS	CESAREAN INCIDENCE (%)	CESAREAN MATERNAL MORTALITY		CESAREAN INFANT MORTALITY	
					TOTAL	%	TOTAL	%
Cody[13]	1941-1950	22,296	231	1.03	2	0.87	25	10.8
Zarou[14]	1944-1950	10,173	400	3.93	1	0.25	20	5.0
Hennessy[15]	1932-1946	15,429	536	3.47	10	1.86	52	9.7
Verch[18]	1933-1947	19,890	1,231	6.19	10	0.81	72	5.55
O'Connor[16]	1932-1946	11,560	821	7.0	3	0.36	--	---
McLean[19]	1937-1949	14,591	1,192	8.16	0	0	63	5.3
Adams[20]	1941-1947	3,045	241	3.1	2	0.8	17	7.1
Levine[21]	1928-1937	13,600	123	0.9	12	9.7	--	---
	1938-1947	25,175	697	2.7	7	1.0	40	5.8
D'Esopo[3]	1942-1947	17,226	1,000	5.8	0	0	37	3.7
Fagan[22]	1925-1949	25,165	2,730	10.85	18	0.659	--	---
Schluter[23]	1938-1950	29,843	823	2.6	2	0.24	44	5.35
Kinne[24]	1931-1950	122,815	4,071	3.31	34	0.83	114*	6.42
Flowers[26]	1946-1950	1,533	88	5.7	1	1.13	--	---
McSweeney[27]	1936-1946	28,341	961	3.3	23	2.4	72	7.5
Nanninga[28]	1943-1948	13,153	1,265	9.6	5	0.39	48	3.8
King[29]	1907-1948	19,060	746	3.91	12	1.61	46	6.1
Andrews[30]	1946-1948	1,793	133	7.4	1	0.75	4	3.0
Dieckmann[31]	1931-1942	29,290	1,500	5.1	9	0.6	113†	7.53
	1942-1949	27,360	1,371	5.0	2	0.15	80‡	5.9
Tamis[32]	1929-1945	22,845	239	1.0	16	6.69	--	---
Irving[33]	1934-1943	45,216	1,887	4.2	24	1.3	274§	15.6
Thoms[34]	1935-1944	10,818	633	5.85	2	0.31	--	---
Andrews[35]	1935-1946	3,935	416	10.5	6	1.44	36	8.6
Low[36]	1925-1949	39,156	1,710	4.37	24	1.28	--	---
Huber[6]	1944-1950	10,208	606	5.9	0	0	28	4.62
Conti[37]	1940-1949	10,499	118	1.09	0	0	16	13.5
Geiger[38]	1928-1947	16,170	454	2.8	15	3.30	39	9.0
Douglas[39]	1932-1948	54,937	1,622	2.9	16	1.0	--	---
Jewett[40]	1949-1950	170,464	7,087	4.16	--	---	--	---
Donnelly[41]	1949	62,897	2,226	3.5	6	0.26	171‖	7.7
Harris[11]	1930-1950	27,692	2,617	9.45	13	0.50	88	3.36
Kistner[42]	1940-1949	24,502	251	1.0	3	1.1	13	5.1
Potter[17]	1938-1947	47,885	1,465	3.1	--	---	--	---
Quigley[43]	1937-1946	68,535	1,693	2.4	16	0.94	134	7.9
Total		1,067,097	43,184	4.05	295¶	0.852#	1,646**	6.75
Louisville	1944-1951	79,114	2,854	3.61	11	0.385	231	8.09
Total		1,146,211	46,038	4.02	306	0.816	1,877	6.89

*Associated with 1,777 cesarean sections.[25]
†All infants 400 grams and over.
‡All infants 1,000 grams and over.
§Includes nonviable infants.
‖First month of life and stillbirths.
¶Associated with 34,632 cesarean sections.
#Based only on reported series with deaths tabulated (34,632 cesarean sections).
**Associated with 24,372 cesarean sections.

In recent years there seems to be a larger number of reports on cesarean section experience in smaller institutions. There is noted, in comparing their experiences with those of larger institutions, a striking similarity in end results.

Referring to Table IV, it will be noted that in more than one million deliveries there have been 46,038 cesarean sections. The average cesarean rate is 4.02 per cent. The average cesarean maternal mortality rate is 0.816 per cent, based on 306 reported deaths associated with 37,486 cesarean sections. The average cesarean fetal loss rate is 6.89 per cent based on 1,877 reported fetal deaths associated with 27,226 cesarean sections. Cesarean maternal mortality in Louisville is less than 50 per cent of the rate for the entire collection but the fetal loss rate is more than 17 per cent greater than the corresponding rate for the collection.

TABLE V. COMPARISON OF INCIDENCES

CESAREAN SECTION INCIDENCE	TOTAL DELIVERIES	CESAREAN SECTION	CESAREAN SECTION RATE (%)	CESAREAN MATERNAL MORTALITY		CESAREAN FETAL MORTALITY	
				TOTAL	RATE (%)	TOTAL	RATE (%)
3% or less	330,494	7,321	2.22	92*	1.26	441†	8.26
Over 3% but less than 6%	693,764	28,044	4.04	157‡	0.805	1,110§	7.52
Over 6% but less than 8%	37,417	2,453	6.56	15‖	0.61	91¶	5.58
8% or more	84,536	8,220	9.72	42#	0.511	235**	4.28
Total	1,146,211	46,038	4.02	306††	0.816	1,877‡‡	6.89

*Associated with 7,321 cesarean sections.
†Associated with 5,337 cesarean sections.
‡Associated with 19,492 cesarean sections.
§Associated with 14,767 cesarean sections.
‖Associated with 2,453 cesarean sections.
¶Associated with 1,632 cesarean sections.
#Associated with 8,220 cesarean sections.
**Associated with 5,490 cesarean sections.
††Associated with 37,486 cesarean sections.
‡‡Associated with 27,226 cesarean sections.

TABLE VI. SERIES WITH CESAREAN INCIDENCE 3 PER CENT OR LESS

AUTHOR AND HOSPITAL	TOTAL DELIVERIES	CESAREAN SECTIONS	CESAREAN SECTION RATE (%)	CESAREAN MATERNAL MORTALITY		CESAREAN FETAL MORTALITY	
				TOTAL	RATE (%)	TOTAL	RATE (%)
Cody[13] Jefferson Davis	22,296	231	1.03	2	0.87	25	10.8
Levine[21] Beth-el	13,600	123	0.9	12	9.7	—	—
Schluter[23] Sutter Maternity	25,175	697	2.7	7	1.0	40	5.8
Tamis[32] Morrisania	29,843	823	2.6	2	0.24	44	5.34
Conti[37] Pittsburgh	22,845	239	1.0	16	6.69	—	—
Geiger[38] St. Joseph	10,499	118	1.09	0	0	16	13.5
Douglas[39] New York	16,170	454	2.8	15	3.30	39	9.0
Kistner[42] Cincinnati General	54,937	1,622	2.9	16	1.0	—	—
Quigley[43] Rochester	24,502	251	1.0	3	1.1	13	5.1
Total	68,535	1,693	2.4	16	0.94	134	7.9
Louisville A	288,402	6,251	2.17	89	1.42	311*	7.29
Louisville D	12,287	325	2.64	0	0	50	15.38
Louisville F	16,421	449	2.73	3	0.668	46	10.24
Total	13,384	296	2.21	0	0	34	11.49
	330,494	7,321	2.22	92	1.26	441	8.26

*Associated with 4,267 cesarean sections.

In Table V, a comparison of incidences has been made, dividing the series into four groups according to reported cesarean incidence (Tables VI, VII, VIII, and IX). It will be noted here that the cesarean incidence and cesarean maternal and fetal mortality are inversely proportional. The chi-square comparison tests were applied to this division of the series and the results were found to be most significant.

TABLE VII. SERIES WITH CESAREAN INCIDENCE OVER 3 PER CENT BUT LESS THAN 6 PER CENT

AUTHOR AND HOSPITAL	TOTAL DELIVERIES	CESAREAN SECTIONS	CESAREAN SECTION RATE (%)	CESAREAN MATERNAL MORTALITY		CESAREAN INFANT MORTALITY	
				TOTAL	RATE (%)	TOTAL	RATE (%)
Zarou[14] Brooklyn Norwegian	10,173	400	3.93	1	0.25	20	5.0
Hennessy[15] St. Vincent's	15,429	536	3.47	10	1.86	52	9.7
D'Esopo[3] Sloane	17,226	1,000	5.8	0	0	37	3.7
Adams[20] Wilcox Memorial	3,045	241	3.1	2	0.8	17	7.1
Kinne[24] Margaret Hague	122,815	4,071	3.31	34	0.83	114*	6.42
Flowers[26] Middlesboro	1,533	88	5.7	1	1.13	—	—
McSweeney[27] Boston City	28,341	961	3.3	23	2.4	72	7.5
King[29] Univ. of Calif.	19,060	746	3.91	12	1.61	46	6.1
Dieckmann[31]	29,290	1,500	5.1	9	0.6	113	7.53
Chicago Lying-in	27,360	1,371	5.0	2	0.15	80	5.9
Irving[33] Boston Lying-in	45,216	1,887	4.2	24	1.3	274	15.6
Thoms[34] New Haven	10,818	633	5.85	2	0.31	—	—
Low[36] Toronto General	39,156	1,710	4.37	24	1.28	—	—
Huber[6] Indiana Univ.	10,208	606	5.9	0	0	28	4.62
Jewett[40] State of Indiana	170,464	7,087	4.16	—	—	—	—
Donnelly[41] State of Iowa	62,897	2,226	3.5	6	0.26	171	7.7
Potter[17] Providence	47,885	1,465	3.1	—	—	—	—
Total	660,916	26,528	4.01	150†	0.834	1,024‡	7.73
Louisville B	10,804	343	3.17	2	0.583	27	7.87
Louisville C	10,860	567	5.22	1	0.176	34	6.00
Louisville E	9,659	557	5.77	3	0.539	24	4.31
Louisville G	1,525	49	3.21	1	2.04	1	2.04
Total	693,764	28,044	4.04	157	0.805	1,110	7.52

*Associated with 1,777 cesarean sections.[25]
†Associated with 17,976 cesarean sections.
‡Associated with 13,251 cesarean sections.

We may conclude from these comparisons that higher cesarean section rates are definitely and significantly associated with markedly lower cesarean maternal mortality rates and considerably lower cesarean fetal mortality rates.

An editorial comment[2] observed that in 1949 the maternal mortality rate for the United States was less than one per thousand live births. Referring further to Table V it will be noted that in the entire collection the average maternal death rate is more than 8 per thousand cesarean sections and that,

where the maternal death rate is lowest, there were more than 5 deaths per thousand cesarean sections—eloquent evidence that cesarean section is not as safe for the mother as vaginal delivery.

TABLE VIII. SERIES WITH CESAREAN INCIDENCE OVER 6 PER CENT BUT LESS THAN 8 PER CENT

AUTHOR AND HOSPITAL	TOTAL DELIVERIES	CESAREAN SECTIONS	CESAREAN SECTION RATE (%)	CESAREAN MATERNAL MORTALITY		CESAREAN INFANT MORTALITY	
				TOTAL	RATE (%)	TOTAL	RATE (%)
Verch[18] Milwaukee	19,890	1,231	6.19	10	0.81	72	5.55
O'Connor[16] Worcester	11,560	821	7.0	3	0.36	—	—
Andrews[30] Moore-White	1,793	133	7.4	1	0.75	4	3.0
Louisville Jewish Hospital	4,174	268	6.42	1	0.373	15	5.51
Total	37,417	2,453	6.56	15	0.61	91*	5.58

*Associated with 1,632 cesarean sections.

TABLE IX. SERIES WITH CESAREAN INCIDENCE 8 PER CENT OR MORE

AUTHOR AND HOSPITAL	TOTAL DELIVERIES	CESAREAN SECTION	CESAREAN SECTION RATE (%)	CESAREAN MATERNAL MORTALITY		CESAREAN INFANT MORTALITY	
				TOTAL	RATE (%)	TOTAL	RATE (%)
McLean[19] Millard Fillmore	14,591	1,192	8.16	0	0	63	5.3
Fagan[22] Good Samaritan	25,165	2,730	10.85	18	0.659	—	—
Nanninga[28] Children's	13,153	1,265	9.6	5	0.39	48	3.8
Andrews[35] Norfolk General	3,935	416	10.5	6	1.44	36	8.6
Harris[11] Cedars of Lebanon	27,692	2,617	9.45	13	0.50	88	3.36
Total	84,536	8,220	9.72	42	0.511	235*	4.28

*Associated with 5,490 cesarean sections.

D'Esopo[3] stated that strict comparisons between clinics are not justifiable because too many variables are concerned in the accounting and that only when the deviations from the average are excessively high or low can we critically indict a given institution for either too radical or too conservative an approach to its labor problems. He further stated that until cesarean section is at least as safe as the more difficult vaginal operations, we are obliged within reason to lean toward the latter in spite of their traumatic possibilities.

In this collection there are six institutions with cesarean maternal mortality rates less than one per thousand in 3,537 cesarean sections. No deaths were reported by them. Yet, we must conclude that on a nationwide basis, cesarean section still is not as safe for the mother as vaginal delivery.

It is interesting to note that there is a significant difference in the maternal mortality rate in this collection and that reported in 1947 by Reis and De Costa.[4] Their data included 731,690 deliveries, of which 25,027 were abdominal deliveries, yielding a cesarean incidence of 3.42 per cent. Their report revealed a cesarean maternal mortality rate of 2.14 per cent, as compared with the present rate of 0.816 per cent. Also, it will be noted that cesarean incidence has increased approximately 17.5 per cent in about five years.

National Cesarean Infant Mortality

Reports[5-10] in recent years have revealed a higher incidence of fetal loss in cesarean sections than in vaginal deliveries. The average national cesarean fetal loss rate, as will be noted in Table IV, is 6.89 per cent. The rates in this collection vary from 3.0 per cent to 15.6 per cent. There is no common standard evident in the consideration of fetal mortality, however. In some reports, weight is the standard and in these the weight varies from 400 to 1,500 grams as the minimum. In other reports, viability and nonviability are used as the standard with no mention made as to the criteria to be used in determining the line of demarcation.

While it is recognized that the cesarean fetal mortality rate, to a certain degree, will be influenced by the indications for the operation, there appears to be a considerable number of fetal losses unrelated to such indications. The operation has been performed too late or too early, the latter contributing to the present high rate of premature infants delivered by cesarean section. X-ray and other studies have not been done often enough to discover the presence of congenital anomalies and a dead or macerated fetus and assist in localizing the placenta and establishing fetal maturity. Conservative management of antepartum bleeding has been shown to result in greater fetal salvage.

With the increasing safety of the operation from the maternal point of view, there has been a rapidly developing trend to utilize cesarean section for the purpose of obtaining a live baby. All too often abdominal delivery does not assure this happy result.

Harris and associates[11] have compared maternal and fetal mortality rates in cesarean section with rates obtained in vaginal deliveries. In the first seven years these rates were greater in cesarean section. In the last thirteen years of the twenty-year experience they reported, they found the maternal mortality rate to be 0.05 per cent in cesarean section compared with 0.08 per cent in vaginal delivery. Fetal mortality rates were 2.99 per cent and 3.13 per cent, respectively. They reported 27,692 deliveries, 2,617 by cesarean section, for an incidence of 9.45 per cent. Although their experience does show a marked improvement in cesarean maternal and fetal mortality rates, the same proportion is not present in vaginal deliveries. The vaginal delivery maternal mortality rate was reduced from 0.1 per cent to 0.08 per cent, while the corresponding fetal mortality showed a reduction from 3.48 per cent to 3.13 per cent. Computing the gross fetal mortality rates for these periods, there is a reduction from a rate of 3.58 per cent to 3.11 per cent. By similar computation the gross maternal mortality rate was reduced from 0.274 per cent to 0.076 per cent.

While Harris and his associates[11] have demonstrated favorable results in their experience, we have no other experience to substantiate a high cesarean incidence. It is essential that more information be made available regarding total deliveries, cesarean incidence, gross maternal and fetal mortality rates, and cesarean maternal and fetal mortality rates. Unless maternal and fetal losses in *all* deliveries are reduced, a high cesarean section rate cannot be justified even though a higher cesarean incidence is associated with lower cesarean maternal and fetal mortality rates and vaginal deliveries are potentially more traumatic to mother and infant. The traumas avoided may be entirely theoretical but the higher cesarean maternal and fetal mortality rates are real.

Comment

The medical literature is replete with reports concerning cesarean section, its maternal and fetal losses, and the clinical conditions which have been used

as indications for the operation. Comparisons have been drawn between the results of cesarean section and vaginal operative deliveries. All of this information has been and will continue to be interesting and important. It is anticipated that future reports on cesarean section will include a review of gross maternal and fetal results to determine the true role of cesarean section in reducing the maternal mortality rate and fetal losses.

Moe,[12] in discussing the value of maternal mortality surveys, stated, "Because we, as obstetricians, are directly responsible for the entire picture of childbirth, it becomes vitally important for us to examine and evaluate all procedures. Such a study," he continued, "will reveal our effectiveness in the practice of obstetrics, and will point up pertinent needs in attaining a still higher level of accomplishment." It is anticipated that efforts of the local medical society's committee on fetal and maternal mortality will become, in this community, the dynamic force which similar units have become elsewhere in the United States. Eventually, it, too, will be able to provide educational material for refresher courses, society and hospital staff meetings, and in the medical school. With the complete cooperation of the medical profession and hospitals and the maintenance of anonymity, this goal can be achieved.

Summary and Conclusions

1. The community experience for eight years has been presented. The average cesarean incidence of eight Louisville hospitals was 3.61 per cent.

2. The community gross maternal death rate was less than one per thousand deliveries and the community cesarean maternal death rate almost four per thousand cesarean sections.

3. The community fetal loss rate was 3.94 per cent in all deliveries and 8.09 per cent in cesarean sections.

4. In a collection of over one million deliveries in the United States and Canada, the cesarean incidence was 4.02 per cent, the cesarean maternal mortality rate 0.816 per cent, and the cesarean fetal loss rate 6.89 per cent.

5. Cesarean incidences are compared and found to be inversely proportional to cesarean maternal and fetal mortality rates.

6. National cesarean incidence is increasing.

7. Criteria for the computation of fetal statistics are variable.

8. Community maternal and fetal mortality surveys should be instituted in every possible instance.

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A CLINICAL COMPARISON OF EXTRAPERITONEAL CESAREAN SECTION AND LOW CERVICAL CESAREAN SECTION FOR THE POTENTIALLY OR FRANKLY INFECTED PARTURIENT*

H. E. Atherton, M.D., F.A.C.S., and Perry J. Williamson, M.D.,
Memphis, Tenn.

(From the Division of Obstetrics and Gynecology of The University of Tennessee College of Medicine and the John Gaston Hospital)

THE following report is a clinical comparison between 68 extraperitoneal cesarean sections and 75 low cervical cesarean sections performed on potentially infected or frankly infected patients at the John Gaston Hospital, Memphis, which is the teaching hospital for The University of Tennessee College of Medicine.

Material and Method

This study covers an eleven-year period from 1941 through 1951, during which time there were 31,017 inpatient and 12,883 outpatient deliveries, making a total of 43,900 deliveries actually performed on the service. Of this number there were 1,054 cesarean sections, giving an incidence of 2.4 per cent. Four types of cesarean sections were employed in the frequency indicated: classical 259, low cervical 694, extraperitoneal 68, and Porro 33.

It is our policy to consider a patient potentially or frankly infected if three or more of the following criteria are present: (1) twenty-four or more hours of labor, (2) rupture of the membranes longer than twelve hours, (3) six or more rectal examinations combined with at least one vaginal examination, (4) an intrapartum temperature of 99.0° F. or higher if the birth canal is the focus of infection. These criteria were present in 75 of the low cervical cesarean sections and in all of the 68 extraperitoneal cesarean sections except 1 elective case associated with essential hypertension. Although many of our patients had amnionitis, we found that this condition was rather difficult to diagnose intra partum because of the poor hygiene of the patients, most of whom were Negroes. Table I reflects the condition of the patients based on the criteria enumerated. The dilatation of the cervix and the engagement are also recorded in this table, as it is our opinion that these factors had some bearing on the degree of infection of the uterine cavity.

Both the extraperitoneal and low cervical cesarean sections have been employed in terminating pregnancy in potentially infected or infected patients, and no maternal fatality has occurred. Some form of chemotherapy, antibiotics, and banked blood were used in both the extraperitoneal series and the low cervical series, even though in the former technique the peritoneal cavity was not entered. Despite the fact that a mortality rate of zero was achieved in each series, which indeed was most fortunate, we do not feel that this alone is sufficient to justify either technique as being superior. The records of the patients under study have, therefore, been carefully analyzed, and we have compared the two groups according to errors of technique, the postoperative course and complications, and infant mortality.

*Presented at a meeting of the Memphis Obstetrical and Gynecological Society, Nov. 10, 1953.

TABLE I. CRITERIA FOR INFECTION OR POTENTIAL INFECTION

	EXTRAPERITONEAL	LOW CERVICAL
Total number of cases	68	75
Age	14 to 41 years	14 to 42 years
Parity:		
Primiparas	42	59
Multiparas	26	16
Hours of labor (average)	32	40
Hours membranes ruptured (average)	24	36
Examinations:		
Rectal (average)	7	9
Vaginal (average)	2	2
Degree of dilatation:		
Under 5 cm.	23	17
5 cm. or more	45	58
Engagement:		
Engaged	34	38
Unengaged	34	37
Temperature prior to cesarean section:		
Afebrile	15	18
Range of 99.0 to 103.8° F.	53	57

TABLE II. INDICATIONS FOR PERFORMING CESAREAN SECTIONS*

	EXTRAPERITONEAL	LOW CERVICAL
Dystocias:		
Cephalopelvic disproportion	24	47
Primary inertia	16	8
Uterocervical dystocia	6	8
Secondary inertia	2	9
Uterine tetany	1	0
Contraction ring	1	0
Contracted pelvis	1	0
Hydrocephalus	1	0
Positional:		
a. Occiput posterior	17	5
b. Transverse arrest	9	0
c. Breech	2	6
d. Face presentation	2	1
e. Compound presentation; prolapsed hand	1	0
Pre-eclampsia	8	0
Eclampsia	0	3
Forceps failure	5	0
Fibromyomas	1	3
Essential hypertension	1	0
Rheumatic heart disease and prolonged labor	1	0
Bag induction failure	1	0
Previous thoracoplasty with prolonged labor	0	1
Fetal distress	0	1
Lymphopathia venereum with chronic inflammation and scarring of birth canal	0	1

*More than a single indication in some cases.

All of the operations were performed by the resident and attending staffs of the Division of Obstetrics and Gynecology of The University of Tennessee College of Medicine. Table II lists the indications for performing the cesarean sections in both groups, dystocia being the most frequent in both series. The

cases included in this study represent patients admitted to our service before intravenous Pitocin became a part of our armamentarium, the use of which has markedly reduced inertia on our service. It is our opinion that the large number of android pelves encountered in Negro patients accounts for a goodly number of the positional dystocias. The 5 cases of forceps failure represent patients in whom delivery was attempted elsewhere before the patients were admitted to our service. Also, many of the other patients upon whom surgery was performed were actually in labor when referred to us. More than a single indication for cesarean section existed in several patients. For instance, the 8 patients with pre-eclampsia and eclampsia also had dystocia. The large number of cephalopelvic disproportions in both series occurred in patients whose pelves were judged to be adequate for delivery from below, and in practically all of these cases, this impression had been substantiated by x-ray studies.

Errors in Operative Technique

The DeLee[1] technique was followed in performing the low cervical cesarean sections. Only one error in operative technique, namely, an overextension downward of the uterine incision, was reported for the entire low cervical series while there were 29 errors in the extraperitoneal series, some of which were serious.

TABLE III. OPERATIVE TECHNIQUE

	EXTRAPERITONEAL	LOW CERVICAL
Anesthesia.—		
Conduction (spinal and caudal)	45	61
Inhalation	13	13
Local infiltration	7	1
Pentothal	3	0
Total	68	75
Operative Techniques.—		
Waters*	37	
Norton†	30	
Latzko	1	
DeLee		75
Total	68	75
Errors in Technique.—		
Peritoneum entered	14	0
Bladder entered	4	0
Ureter exposed unduly	4	0
Shock from blood loss from operative field	2	0
Bladder severed from urethra	1	0
Laceration of baby's scalp by Allis forceps	1	0
Uterine incision overextended	1	1
Excessive uterine hemorrhage	1	0
Uterine artery cut	1	0
Total	29	1

*Total number of errors with Waters technique, 14.
†Total number of errors with Norton technique, 15.

In the extraperitoneal series, the technique of Waters[2] was employed 37 times, the procedure described by Norton[3] was used 30 times, and the Latzko[4] technique was followed once (Table III). We have recorded the number of times the peritoneum was entered, and in each of the 14 instances the rent was immediately sutured or ligated; under such circumstances, however, one must

assume some intraperitoneal contamination. The bladder was entered inadvertently 4 times. In each case the bladder was repaired immediately and healed without incident. Our most serious error in technique was a complete severance of the bladder from the urethra while a Norton procedure was being performed. This case required urological consultation and management, but good bladder function was eventually recovered. In 4 cases the ureter was unduly exposed, and, although it was not cut, we feel that it was most vulnerable to injury and were concerned for its blood supply. The uterine incision was overextended in one case which made closure difficult. In one case in which an Allis forceps was used to deliver an impacted head, the baby's scalp was lacerated. This situation could have been obviated if an assistant had pushed the head through the incision by vaginal manipulation as has been done previously. Excessive blood loss occurred in 4 patients. The uterine artery was accidentally severed in one patient; 2 other patients went into shock due to blood loss from the operative field, and one had excessive uterine bleeding. The type of anesthesia employed made little difference as far as the actual performance of the operation was concerned, but, for the sake of the baby, inhalation anesthesia was not used except where the condition of the patient dictated its employment. Spinal anesthesia produced hypotension in one patient, which resulted in intrauterine asphyxiation of the fetus.

Postoperative Course and Complications

Using 100.4° F. for 2 or more days as the standard temperature for measuring morbidity, the extraperitoneal series had an average of 5 days' morbidity, while the low cervical series had an average of 2 days. The longest period of morbidity was 25 days for the former and 7 days for the latter. Today's high cost of hospitalization decrees the employment of any procedure which reduces the patient's hospital stay, yet accomplishes as good a result as other procedures which prolong the period of hospitalization. The average postpartum hospital stay for patients who had extraperitoneal cesarean sections was 14 days as compared to 9 days for the patients in the low cervical series.

Table IV lists the postoperative complications for the two groups. There were 19 wound infections for the extraperitoneal cesarean sections while only 2 were present in the low cervical series. The unusual number of wound infections might be attributed to the fact that, at the time of surgery, cigarette drains were brought out through the operative incision in all of the extraperitoneal cesarean sections. The second most frequent postoperative complication was endometritis. Since all of the cases were potentially or frankly infected at the time of operation, however, this could be expected. Despite the fact that endometritis was present in many of the uteri at the time of closure, only one case of peritonitis occurred and that in a patient in the extraperitoneal section series who developed a pelvic abscess. The one case of intestinal obstruction which was of the adhesive type occurred in this patient also. Parametritis was recorded once in the extraperitoneal series and twice in the low cervical series. Paralytic ileus requiring therapy was present 5 times in the extraperitoneal series and 3 times in the low cervical series. The long periods of labor and trauma of operation were thought to be responsible for this condition. Urinary tract complications were surprisingly infrequent except where serious injury had taken place at the time of operation. Pyelonephritis was present 5 times in both series. Three patients in the extraperitoneal series had atonic bladders which required more than the usual amount of postoperative catheter drainage. Cystitis was difficult to diagnose in the extraperitoneal group because of the cellular reaction due to the trauma of

operation. There were 3 such diagnoses in the low cervical series. We were indeed surprised at the minimal bladder dysfunction encountered following the extraperitoneal cesarean sections. There was one case of vesicocervical fistula which required surgical correction. Bronchopneumonia was present twice in the extraperitoneal series as compared to 4 times in the low cervical series. This complication offered no great problem in either group. There were a number of other complications, such as allergic dermatitis from penicillin, transfusion reaction, anuria, psychosis, and hepatitis, which were not attributed to the operations. Our patients who were subjected to extraperitoneal cesarean section presented a greater number of serious postoperative complications than those upon whom low cervical cesarean section was performed, and on the average had a more protracted hospital stay. We are cognizant of the fact that the free administration of chemotherapy, antibiotics, and banked blood was a potent factor in the achievement of a mortality rate of zero for the two series and was also vital in controlling the postoperative complications.

TABLE IV. POSTOPERATIVE COURSE AND COMPLICATIONS

	EXTRAPERITONEAL	LOW CERVICAL
Total number of cases	68	75
Average number of days febrile	5	2
Average number of postpartum hospital days	14	9
Total number of hospital days	981	700
Number of patients who received chemotherapy, antibiotics, and/or blood	68	73
Complications:		
Wound infections	19	2
Endometritis	13	5
Pyelonephritis	5	5
Paralytic ileus	5	3
Bronchopneumonia	2	4
Atonic bladder	3	0
Parametritis	1	2
Cystitis	0	3
Psychosis	2	0
Transfusion reaction and anuria	1	1
Allergic dermatitis (penicillin)	1	0
Vesicocervical fistula	1	0
Hepatitis	1	0
Pelvic abscess and peritonitis	1	0
Intestinal obstruction	1	0
Total	56	25

Infant Mortality

Since practically the same clinical criteria given in Table I existed in all of the patients in both series, it is our opinion that the type of operation had something to do with a larger infant mortality in the extraperitoneal series (19.1 per cent) as compared to the low cervical series (9.3 per cent). All of the babies weighed 2,500 grams or more. In those cases in which inhalation anesthesia was used, the patient was prepared in the conventional manner and everything made ready for the incision to be made before the patient was anesthetized. The majority of the deaths were caused by abnormal pulmonary ventilation which was, in part, the result of prolonged labor, infection of the birth canal, and the formidability of the extraperitoneal cesarean section. Our obstetricians can perform the low cervical cesarean section with greater

facility and speed than they can the extraperitoneal cesarean section. Table V lists the causes of deaths for both series. In the extraperitoneal series there were 6 stillbirths and 7 neonatal deaths as compared to 1 stillbirth and 6 neonatal deaths in the low cervical group.

TABLE V. INFANT MORTALITY

	EXTRAPERITONEAL	LOW CERVICAL
Total number of infant deaths	13	7
Fetal mortality incidence	19.1%	9.3%
Stillbirths:		
Intrauterine asphyxia	5	1
Intrauterine anoxia due to spinal anesthesia	1	0
Total stillbirths	6	1
Neonatal deaths:		
Bronchopneumonia	1	1
Atelectasis	3	3
Atelectasis and pneumonia plus bilateral ureteral obstruction	1	0
Diffuse pulmonary hemorrhage and intracranial hemorrhage	1	0
Subarachnoid hemorrhage, adrenal cortical necrosis, intrapartum anoxia	1	0
Intracranial hemorrhage	0	1
Asphyxia due to aspiration and pulmonary hemorrhage	0	1
Total neonatal deaths	7	6

Comment

It has been our purpose, as stated initially, to review the results obtained in employing two different procedures upon the same type of patients on our service by our own operators. No attempt has been made to compare our results with those of other teaching centers. Inasmuch as the John Gaston Hospital receives many patients in labor who have never been under the direct surveillance of our service until they are actually admitted to the maternity pavilion for delivery, infection has always been a major problem. When we first began to perform extraperitoneal cesarean sections in 1941, the attending staff was highly enthusiastic about the procedure in cases of potentially or frankly infected parturients. It soon became apparent, however, that, with the fortification of chemotherapy, antibiotics, and banked blood, the low cervical cesarean section could be employed on the infected parturient with a better result than that accomplished by the extraperitoneal procedure. After a careful analysis and comparison of the infected cases that have been subjected to one or the other operation, we have practically abandoned the extraperitoneal section except in selected cases for teaching our residents since 1951. We repeat that we have been most fortunate in not having had a maternal fatality in either the potentially or the frankly infected series reported here, and a comparison of operative errors, postoperative course, and infant mortality convinces us that, at least in our hands, the low cervical cesarean section is the better procedure.

Conclusions

1. Sixty-eight cases of extraperitoneal cesarean section have been clinically compared with 75 low cervical cesarean sections performed on potentially infected or frankly infected patients on the service of the John Gaston Hospital.

2. Low cervical cesarean section has proved superior to the extraperitoneal section for such cases on our service.

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1428 Madison Avenue (Dr. Atherton)

SADDLE BLOCK ANESTHESIA IN OBSTETRICS*

COURTNEY D. EGERTON, LIEUTENANT (MC) USNR**

(From the Department of Obstetrics and Gynecology, United States Naval Hospital, Bethesda, Maryland)

THE advantages of saddle block and other forms of conduction anesthesia for obstetrical delivery are now well known. The literature on this subject has been abundant in the past few years, and the popularity of the conduction anesthesias has been growing rapidly. The increased safety for mother and fetus, the higher degree of relief of pain, simplicity of administration, and increased ease of delivery[1] have made saddle block the choice method of anesthesia in many large maternity clinics in this country.

There are, of course, certain disadvantages to saddle block anesthesia which are often pointed to by its critics. The ever-annoying problem of postspinal headaches, the danger of a fall in blood pressure, and the very rare occurrence of neurological sequelae must, of course, be kept in mind. Another very real problem is the almost general fear among patients of "a spinal."

Saddle block was the anesthesia of preference at the United States Naval Hospital, Bethesda, Maryland, and was used almost routinely unless there was a definite contraindication. Although the staff as a whole was very favorably impressed with saddle block, we asked ourselves the following questions: 1. How effective was the relief of pain we were giving to our patients? 2. How safe was it? 3. In what ways did saddle block affect our management of labor or delivery? 4. What was our percentage of postspinal headaches and in what ways was our technique responsible? 5. What did the patients themselves think of saddle block anesthesia?

Material and Methods

A series of 839 cases was collected and the anesthesia questionnaires were statistically analyzed. These were not consecutive cases though the only selection was the requirement that the record be complete. The series would have been larger had we been able to use every questionnaire.

We used saddle block primarily as a delivery anesthesia as suggested by Andros and associates,[2] not so much for relief of discomfort in the first stage of labor. It was usually given to primigravidas only after complete dilation and descent of the presenting part to or near the perineum. Multiparas were anesthetized earlier, anywhere from 6 cm. dilation to delivery.

Pontocaine hydrochloride, 4.0 mg., or 2 c.c. of a 2 per cent solution in 10 per cent dextrose, was the agent used in all these blocks. Needles of 22 and 24 gauge only were used without the aid of a larger director needle. We found it unnecessary to make a skin wheal for relief of pain at the site of in-

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**Present address: 714 St. Marys Street, Raleigh, N. C.

jection. With the patient sitting up with head bowed, the lower back was painted with an antiseptic and draped with a sterile towel. The needle was then inserted through the third, fourth, or second lumbar intervertebral space (in that order of preference) with bevel turned sidewise and, after a free flow of cerebrospinal fluid was assured, the Pontocaine was injected in 10 to 15 seconds, between contractions. The patient was allowed to sit upright for a total of 25 seconds, the needle quickly withdrawn, and the patient immediately placed in supine position with the head on a double pillow and legs high in stirrups. The blood pressure was checked just prior to anesthesia, 5, 10, and 15 minutes after the injection and thereafter every 15 minutes. Saddle block was rarely given if systolic pressure was under 110 mm. Hg, never if below 100 mm.

Most of these blocks were given by the interns under supervision of a member of the staff. If the subarachnoid space had not been entered in three attempts, they were instructed to desist and some other form of anesthesia was used. After the operator became proficient, the whole procedure took less than one minute.

Results

The effectiveness of the anesthesia was evaluated by the attendant on the basis of 50 per cent for perineal anesthesia, and 50 per cent for uterine anesthesia or relief of the pain of labor contractions. If a patient received complete relief, both perineal and uterine, the saddle block was judged to be "100 per cent effective."

TABLE I. EFFECTIVENESS OF ANESTHESIA

100% effective	681	81.2%	
Incomplete analgesia	153	18.2%	
Complete perineal, partial uterine	134		15.9%
Both partial	19		2.3%
No analgesia (complete failure)	5	0.6%	

Table I shows there were 681, or 81.2 per cent, patients who received 100 per cent relief. Of the "incomplete analgesias," 134 (15.9 per cent) had complete perineal analgesia, i.e., delivery, episiotomy, and repair were without pain, but they continued to feel their uterine contractions to some extent. When it is recalled that T_{11} and T_{12} must be completely blocked to interrupt the afferent fibers arising from the fundus,[3] and saddle block is designed primarily to block S_2, S_3, and S_4, the fibers from the cervix, vagina, and perineum, this deficiency should be neither surprising nor disappointing. These actually are very satisfactory blocks.

There were only 5 "complete failures" and it can only be assumed that the needle must have slipped out of the subarachnoid space before injection of the Pontocaine.

TABLE II. SUPPLEMENTARY ANESTHESIA NECESSARY

Inhalation	13	1.5%
Pudendal (or local infiltration)	5	0.6%
Intravenous Nembutal	1	0.1%
Total	19	2.2%

Table II shows that the necessity for supplementary anesthetic measures was very rare.

As has been reported before,[2, 4] the use of saddle block, like other forms of conduction anesthesia, increases the incidence of operative deliveries. Table III reveals this to have been true in our series.

TABLE III. TYPES OF DELIVERY

Spontaneous	148	17.6%
Low forceps	627	74.7%
Midforceps	45	5.4%
Breech (spontaneous with assistance)	19	2.3%

The great majority of the 627 low forceps deliveries were elective or prophylactic. The 5.4 per cent midforceps is undoubtedly higher than in clinics where conduction anesthesia is not often used. Most of these midforceps deliveries were performed as part of a forceps rotation of occiput posterior and transverse arrest presentations. There were a total of 71 such cases in which the head failed to rotate to occiput anterior, an incidence of 8.5 per cent. Of these, 39 were rotated manually and 32 by forceps. The abolished perineal tone and abdominoperineal "push" were, of course, greatly responsible for this increased incidence. Because of this same relaxation, however, these rotations were generally much easier than under a general anesthetic. An elective episiotomy, either median or mediolateral, was employed in 94.7 per cent of the cases. Consequently, the incidence of lacerations was only 4.8 per cent.

Table IV demonstrates the wide applicability of saddle block to many complications of pregnancy and labor.

TABLE IV. COMPLICATIONS OF PREGNANCY AND LABOR

Premature separation of placenta	9
Premature delivery	6
Twins	5
Hypertensive cardiovascular disease	4
Pre-eclampsia, mild	4
Spontaneous pneumothorax	1
Rheumatic heart disease	1
Polyhydramnios	1
Rh sensitization	1
Prolapsed cord	1
Face presentation	1
Marginal sinus rupture	1

Table V lists the complications and morbidity, exclusive of headaches, attributable to saddle block.

TABLE V. COMPLICATIONS DUE TO SADDLE BLOCK

Fall in blood pressure sufficient to require treatment	5	0.6%
Backache at injection site	2	0.2%
Meningismus, mild	1	0.1%
Atony of bladder	1	0.1%
Drug sensitivity	0	0.0%
Permanent neurological sequelae	0	0.0%

In any case in which there was a drop in blood pressure to 90/60 the usual treatment of oxygen inhalation, elevation of legs, intravenous fluids, and occasional intravenous ephedrine was instituted. None of the 5 cases in this category was severe. There were no cases of permanent neuropathy known to any members of the Obstetrical Department.

There were no cases of fetal depression attributable to the saddle block anesthesia. Indeed, most of the babies breathed or cried a few seconds after delivery of the head.

Headaches

All postpartum headaches were recorded daily by the staff member in charge of the postpartum ward. An attempt was made to classify the head-

aches as to severity, grading them as plus 1, plus 2, plus 3, or plus 4. This classification was based on the degree of complaints and incapacitation of the patient. Table VI shows the results of this classification.

TABLE VI. HEADACHES

All headaches	282		33.6%	("absolute")
Not clinically significant		81		9.6%
Clinically significant	201		23.9%	
Grade I		87		10.3%
Grade II		99		11.8%
Grade III		10		1.2%
Grade IV		5		0.6%

In an effort to be absolutely objective in this study, all headaches were recorded. Many of these were undoubtedly not true postspinal encephalopathies. There was a total of 282 cases, or 33.6 per cent, which we have chosen to call our "absolute percentage." Eighty-one cases were very mild, lasted less than one day, and were often relieved by such simple measures as increasing the ventilation in the ward, turning down the heat, treatment of constipation, nasal congestion, or breast engorgement. If this group, comprising an incidence of 9.6 per cent, is classified as "not clinically significant" and subtracted from the total, it leaves a "clinically significant" group of 201 cases, or an incidence of 23.9 per cent. This exclusion seems justified on the basis of a small control series of 56 cases which received some anesthetic other than saddle block. In this group there were 7 patients who complained of headache, an incidence of 12.5 per cent.

In grading the severity of these headaches, the highest grade recorded on any one day determined the category in which that patient was recorded. For instance, if a patient had a headache for four days, plus 1 on three of those days and plus 2 on a single day, she was classed as a Grade II. Grade I might just as well be interpreted as "mild," Grade II as "moderate," and Grades III and IV as "severe."

In analyzing these headache records, it was found that parity made no significant difference, 51.7 per cent being primiparas and 48.3 per cent multiparas, about the same percentages as in the series as a whole. Nor was there any significant difference in the incidence of headaches dependent upon the interspace used as the site of injection.

A small group of 45 patients was given an infusion of 1 L. of 5 per cent glucose in distilled water while on the delivery table as a method of prophylactic hydration. In this small series the incidence of headache was almost as high as the over-all incidence. All patients were encouraged to drink a minimum of 3,000 c.c. of fluid daily immediately postpartum.

Green and associates,[5] Huston and Lebherz,[6] and others have convincingly shown that the smaller the gauge of the spinal needle, the lower the incidence of headache will be. We used only 22 and 24 gauge needles and there was a slight difference in favor of the 24 gauge needle with which there were 17.9 per cent clinically significant headaches as compared to 24.8 per cent for the 22 gauge. Green and his group obtained a difference of 2.5 per cent compared to 26 per cent.

TABLE VII. ATTEMPTS AT INSERTION OF NEEDLE

ATTEMPTS	TOTAL	NO. WITH HEADACHES	% WITH HEADACHES
1	606	186	30.7
2	161	66	40.9
3	62	25	40.3
4	10	5	50.0

Table VII shows that the percentage of headaches definitely does increase with the number of attempts at insertion.

The staff as a whole was convinced that there is a large psychic factor involved in the development of postspinal headaches and that many are initiated or exaggerated by the power of suggestion and the close proximity of other patients in the same ward who have headaches. We purposely avoided asking directly "Do you have a headache?" and we tried not to incriminate the anesthesia given as the cause. However, in a large open ward, "the word gets around."

The question "Does the patient in the bed next to you have a headache?" was designed to evaluate this power of suggestion, but it failed to show any significant difference.

That there is definitely a headache-prone type of patient is suggested, however, by Tables VIII and IX.

TABLE VIII. HEADACHES DURING PREGNANCY

	TOTAL	WITH POSTSPINAL HEADACHES	PER CENT
Denied	674	205	30.4
Admitted	165	77	46.6

As seen in Table VIII the incidence of postpartum headaches is appreciably higher in patients who were annoyed by headaches during pregnancy.

TABLE IX. PREVIOUS SPINAL ANESTHESIA: 132 CASES

	TOTAL	HEADACHE THIS TIME	PER CENT
Denied previous headache	94	31	32.9
Admitted previous headache	38	17	44.7

Table IX suggests that a patient who has previously had spinal anesthesia followed by a headache is more likely to have a postspinal headache this time.

Patients' Opinions of Saddle Block

In this day and age when every mother and potential mother considers herself a learned authority on obstetrics, it behooves the obstetrician to choose an anesthetic that is not only safe and effective but one which his patient will like. For this reason patients who had had saddle block were asked upon discharge from the hospital, "Were you satisfied with saddle block?" and "Would you request it again for your next delivery?" Their answers were again categorized as to whether they had suffered any degree of postpartum headache.

TABLE X. PATIENTS' REACTIONS TO SADDLE BLOCK

SEVERITY OF HEADACHE	SATISFIED	WOULD REQUEST AGAIN	UNDECIDED
None	503 (90.3%)	490 (87.9%)	18 (3.2%)
Not clinically significant	74 (91.3%)	71 (87.6%)	
Clinically significant (all grades)	164 (88.1%)	135 (67.1%)	9 (4.4%)
All patients	741 (88.3%)	696 (82.9%)	27 (3.2%)

It was gratifying to find that 88.3 per cent of all the patients in this series were satisfied with their anesthesia, 82.9 per cent to the extent that they would request it for the next delivery. As would be expected, those with headaches

were somewhat less enthusiastic, but two out of three of these patients still said they would request saddle block again. The most frequent excuse for not wishing saddle block again was, "I'd rather be asleep."

Multiparas who had previously had some other form of anesthesia for a delivery were asked which they liked best. Table XI shows the comparisons made by 245 such patients who answered this question.

TABLE XI. COMPARISONS WITH OTHER ANESTHETICS (245 MULTIPARAS)

OTHER ANESTHETIC	NO. CASES	PREFERRED SADDLE BLOCK	PREFERRED OTHER
Inhalation	188	130 (69.1%)	58 (30.9%)
Local (pudendal)	14	11 (78.6%)	3 (21.4%)
Caudal	24	13 (54.2%)	11 (45.8%)
Intravenous (barbiturates)	10	3 (30.0%)	7 (70.0%)
None ("natural childbirth")	9	6 (66.7%)	3 (33.3%)
Total	245	163 (66.4%)	82 (33.7%)

Sixty-nine per cent of these patients preferred saddle block to the inhalation they had had previously. Local anesthesia was even less popular, and more than half the patients who had had caudal still preferred saddle block. Only intravenous anesthesia, mostly Pentothal sodium, was more popular than saddle block, but these patients were undoubtedly not aware of the dangers of this form of anesthesia as are obstetricians. Again it was gratifying to note that even among patients in this group who had headaches, 57 per cent still preferred saddle block (not shown in table).

Comment

The reported "absolute" incidence of headaches, 33.6 per cent, is admittedly very high, and even the 23.9 per cent of clinically significant headaches is a higher rate than reported by most others who have written on saddle block anesthesia. We have no satisfactory explanation for this high incidence. Perhaps we were too objective. Possibly our selection of patients for saddle block should be more restricted. It may be that our technique should be changed. Huston and Lebherz,[6] in their excellent presentation of their technique using a 24 or 26 gauge needle inserted through a shorter 20 gauge "director" needle, reported an incidence of only 4.6 per cent headaches, 2.8 per cent recorded as "typical spinal headaches."

No mention of treatment of these postspinal headaches has been made simply because we have no "miracle cure" to report. We have employed all the commonly recommended methods of treatment and found none to be universally effective. It is our impression that we have had the best results, mainly in the milder headaches, with a tight abdominal binder plus forced hydration.

If there is anything new to be learned from this series, it is the fact that the great majority of the patients became enthusiastic advocates of saddle block anesthesia. Most of these patients were somewhat apprehensive about spinal anesthesia before delivery, and, though we never forced it on a patient who was definitely opposed to it, it was often necessary to explain to a patient that we felt it was safer for her and her baby. The fact that the patient was usually pleased with the anesthesia seemed to justify any persuasion necessary on our part.

Summary

A series of 839 cases of saddle block anesthesia using 4.0 mg. of Pontocaine hydrochloride has been presented and analyzed as to its effectiveness, safety, and effect on delivery. An "absolute" incidence of 33.6 per cent postpartum headaches and a 23.9 per cent incidence of "clinically significant" headaches is reported. The selection of cases and technique employed have been analyzed as to the effect on the incidence of headache. Finally, the patients' personal reactions toward saddle block were analyzed.

Conclusions

1. Saddle block is a very satisfactory form of anesthesia for delivery, being highly effective in relieving pain, safe for both mother and fetus, and convenient for the physician.

2. The frequent occurrence of postspinal headache remains the greatest objection to saddle block anesthesia. When methods have been devised to prevent these headaches entirely, or to treat them simply and effectively, then saddle block will very nearly approach the "ideal" as an obstetrical anesthetic.

3. The smaller the needle used and the fewer the attempts at insertion, the less likely are headaches to occur.

4. Patients who have had troublesome headaches during pregnancy or following a previous spinal anesthesia probably would be better candidates for some other form of anesthesia.

5. The great majority of these patients were pleased with saddle block and preferred it to other forms of anesthesia previously experienced.

6. The mere apprehension of spinal anesthesia is not a contraindication to the use of saddle block.

Special acknowledgment is made to Elfred Lampe, Lieutenant (MC) USNR, who initiated this study before he was transferred to another duty station.

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EPIDURAL INJECTION OF NORMAL SALINE AS A MEANS OF PREVENTION OF SPINAL HEADACHE

L. B. Mehl, M.D., Akron, Ohio

(From the Department of Obstetrics and Gynecology, St. Thomas Hospital)

HEADACHE following the use of low spinal or saddle block anesthesia for vaginal delivery is a most annoying complication which, with the increasing use of this type of anesthetic, confronts us with a major problem.

Various complications of spinal anesthesia are referred to in the literature, such as severe hypotension, nausea and vomiting, intrathecal infections, neurological sequelae, and even death. Far surpassing all these in frequency, however, is postspinal headache.

The reported incidence of headaches following saddle block anesthesia for delivery varies widely, from 5 to 26 per cent.[6-10] This wide variation makes one wonder if a common criterion for diagnosis of postspinal headache has been found. We all know the prevalence of postpartum headache among convalescent patients.

Many of these headaches have their origin in other factors, closely related to labor and the puerperium, namely, psychological tensions associated with fear and anxiety, the rapid physiological changes occurring post partum, allergic manifestations toward drugs, dehydration and/or blood loss at the time of delivery. Suggestion may play a prominent role, coming either from other patients or from hospital personnel. I recall two patients reported by the nurse as having spinal headache, to whom no spinal anesthetic had been administered. In the same ward, however, was a patient who did have a headache as a result of saddle block anesthesia.

Thus, it is important that some definite criteria be established, so that headaches from other causes may be eliminated from any statistical study. In this series we have set up the following conditions for admission into the category of spinal headaches: (1) A spinal puncture must have been formed. (2) The headache occurs or is aggravated when the patient changes from a horizontal to the vertical plane. (3) The headache occurs in the frontal, temporal, or occipital regions, usually described as pressure or fullness, and often associated with tenderness and feeling of tension in nuchal and shoulder muscles.

In addition to these conditions we have observed that most cases of postspinal headaches are relieved by epigastric pressure, and almost all are cured by one or more epidural injections of saline solution.

There is little to be gained by a prolonged discussion of the theories of the causation of spinal headaches following delivery, the consensus today being that there are at least two major causes involved: (1) The sudden release of intra-abdominal pressure following delivery of the child, producing a pooling of blood in the splanchnic vessels. This pooling may be even further increased

because of vasomotor paralysis due to the action of the spinal anesthetic on the sympathetic nerves.[1, 11] (2) The spinal fluid leak from the puncture in the dura and arachnoid membranes. Gardner[2] states that the cerebrospinal fluid is lost through the opening in the arachnoid, allowing the brain to settle in the cranial cavity. Wolff[3] believes also that with spinal fluid loss the fluid support of the brain is lessened, resulting in traction and tension on the blood vessels and the cranial nerves, producing headache.

In an attempt to correct one or both of these factors many procedures have been advocated. In recent literature the use of abdominal binders to increase abdominal pressure was suggested by Weintraub.[1] This method was given further support in an article by Leighton and Hershenson[11] in which they reported an incidence of only 3.4 per cent spinal headache with the application of epigastric pressure by a spinal belt.

The use of a pencil-point needle for spinal puncture was first attempted by Greene in 1923, and later in over 3,000 cases by Hart and Whitacre.[4] They were able to reduce their spinal puncture headaches to about 3 per cent. The use of finer-gauged needles in performing spinal punctures has generally been adopted in an attempt to prevent fluid leakage and reduce the incidence of postpuncture cephalgia.

Flowers, Hellman, and Hingson[5] reported the successful relief of headache after spinal injection, utilizing continuous peridural injection of saline. In 1951 McCord, Epperson, and Jacoby[6] treated 15 patients with severe postspinal headache with epidural injection of 70 to 100 c.c. of normal saline. The headache was immediately relieved. Three patients, however, had a return of the headache in 24 to 48 hours. A second injection of the same solution gave permanent relief.

In our series two patients with moderately severe postspinal headache were treated with normal saline injection into the caudal canal. Almost immediate relief was obtained after the injection of 40 c.c. of the solution. An attempt to perform the same procedure in a third case was unsuccessful as the sacral hiatus could not be entered.

At this hospital, another method of preventing escape of spinal fluid following administration of saddle block was thought possible, namely, the injection of normal saline epidurally at the site of, and immediately following, the administration of the spinal anesthetic. This solution should act as a tamponade, and temporarily prevent reduction in intracranial pressure. It should compress the arachnoid and lessen the negative pressure in the epidural space, thus decreasing the possibility of spinal fluid leak from the puncture wound in the dura-arachnoid.

In an effort to evaluate the results, using this method, a preliminary report on its use in 100 cases is being given.

Material and Methods

These 100 cases were selected on the following bases: The willingness of the patient to have a saddle block anesthesia for delivery, and the permission of the attending physician to use the previously described procedure. No clinic charity cases were used.

The spinal anesthetics and saline injections were administered by the residents on the obstetrical and gynecological service. All had been well versed in spinal puncture procedures, but had received no special training in anesthesiology.

The majority of the injections were carried out in the delivery room after the usual sterile preparation of the lower back. Local infiltration of the skin with Novocain was not used.

A 22 gauge spinal needle was used in all cases. The puncture was performed at the level of the third or fourth lumbar interspace, whichever was the more convenient. Heavy Nupercaine, 2.5 mg., was used routinely as the anesthetic agent.

The technique as given by Parmley[7] was followed, except that not all patients were placed in a sitting position for the administration of the spinal puncture. In more than half the cases, the patient was given the spinal anesthetic while lying on her side. After the injection of the anesthetic material (heavy solution of Nupercaine) and the normal saline solution, the patient was turned on her back and a pillow was placed under the head and neck. In addition, the entire upper portion of the delivery table was inclined so that the patient was in a 30 degree Fowler position.

The tamponade was performed in the following manner: After injection of the 2.5 mg. of heavy solution of Nupercaine, the spinal needle was withdrawn approximately ¼ to ⅜ of an inch. At this distance fluid would not drop from the open needle. For added safety aspiration with the syringe was attempted. If no return of fluid was then observed, a 20 c.c. syringe was attached to the spinal needle and 10 to 15 c.c. of normal saline was injected epidurally.

In the series of 100 patients who received normal saline epidurally, there were 28 primaparas and 72 multiparas. The ages of the patients ranged from 18 to 40 years. Complications of more than minor importance were present in 8 cases: upper respiratory infections in 3 cases, 2 cases of abruptio placentae (mild), one case of marginal placenta previa, and one mild and one moderately severe case of pre-eclampsia.

There were 5 patients who previously had developed headache following spinal anesthesia. Only one of these complained of headache after saddle block followed by epidural injection of normal saline.

There were 11 patients in whom more than one puncture was necessary because of uncertainty as to the entrance of the needle into the spinal canal. One of these developed a typical postspinal headache.

Results

There were 3 patients (3.0 per cent) who developed spinal headache during the postpartum period, one on the second day, the other two on the third day after delivery. As mentioned before, two of these patients were immediately relieved of headache by injection of 40 c.c. of saline solution into the caudal canal. The third was treated with epigastric pressure and small doses of codeine and aspirin.

The follow-up of the 100 cases was conducted by the resident each morning. No patient was asked about headaches directly, as we have learned by experience that one can easily be misled. It is better to wait until the patient volunteers the complaint; then suitable questioning is conducted to determine the severity, the duration, the location, and the effect of assuming the upright position.

It should be mentioned that no attempt was made to restrict the patient's activity nor to interfere with the general hospital routine. In fact, progressive early ambulation was encouraged as with all our postpartum patients.

Controls.—In a second series of 138 patients who were delivered under saddle block anesthesia, without the epidural injection of normal saline, 13 (9.3 per cent) developed spinal headache. These patients had received the same medication intrathecally, and the same technique was used for spinal puncture.

Summary

1. This paper reports on 238 cases in which low spinal or saddle block anesthesia was used for vaginal delivery.

2. One hundred of these cases received in addition to the spinal anesthetic the epidural injection of normal saline solution immediately following the administration of the anesthetic material.

3. Three out of a hundred patients in whom epidural saline was injected developed spinal headache (3 per cent). This percentage is to be compared with the 9.3 in 138 patients in whom the epidural saline was not used.

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THE CLINICAL USE OF APRESOLINE IN THE TOXEMIAS OF PREGNANCY

A Preliminary Report

EUGENE R. CHAPMAN, M.D.,† WILLIAM E. STROZIER, M.D., AND ROBERT A. MAGEE, M.D., SAN ANTONIO, TEXAS

(From the Department of Obstetrics and Gynecology, the Robert B. Green Memorial Hospital)

THE toxemias of pregnancy account for at least 30,000 stillbirths and neonatal deaths every year and from 10 to 30 per cent of maternal fatalities.[9] Therefore, the management of this group of diseases constitutes one of the major problems confronting the obstetrician during the last trimester of gestation.

Unfortunately, the underlying cause of the toxemias is unknown. Even the basic pathologic changes are not clearly understood, although there is definite evidence that the disease is associated with a type of vascular disorder in which the arterioles are affected. In eclampsia, many vital organs show signs of severe spasm of the arterioles and frequently a precapillary arteriolitis as well. Such changes account for hypertension; thromboses and hemorrhages in the brain, heart, and adrenals; and the glomerular damage which causes the albuminuria and anuria. In fact, generalized vasoconstriction may be sufficiently acute to cause localized necrosis in any or all organs.

Since hypertension and signs of renal damage are almost universally exhibited by toxemic patients,[8] we have employed Apresoline,* which is an antihypertensive agent that also seems to increase renal plasma flow.

Pharmacology

Many laboratory and clinical investigations[1, 3, 5, 6, 10-12, 15-18, 20, 22, 23, 25-31, 33-36, 41-43, 46] indicate that the action of Apresoline is primarily central but does not depend on a sedative component. It is capable of lowering diastolic as well as systolic pressure in various types of hypertensive states.

A derivative of phthalazine, the drug apparently increases circulation through the kidney, affecting both afferent and efferent arterioles, at the same time that it lowers the blood pressure.[1, 2, 7, 10, 18, 20, 22-24, 27, 29-36, 38, 41, 44, 45] Also, hepatic-portal blood flow seems to be increased significantly.[13] Furthermore, Apresoline may cause a significant relaxation of cerebral vascular tone[19-22] without reducing cerebral blood flow. Effective orally and parenterally,[1, 10, 18, 20, 22, 23, 27, 29-36, 38, 40, 41] the drug has a relatively low toxicity[5, 6, 17, 37-39, 42] and rarely produces serious side effects.

*The Apresoline (1-hydrazinophthalazine) used in this study was supplied by courtesy of Ciba Pharmaceutical Products, Inc., Summit, New Jersey.

†Died Jan. 22, 1954.

In addition to its use in essential and malignant hypertension, Apresoline has previously been reported to be a real aid in the management of the toxemias of pregnancy. Assali and his colleagues[1, 2] used Apresoline intravenously in pregnant patients with normotension, essential hypertension, and toxemias. In brief, this group found consistent lowering of blood pressure in toxemic patients, and the diastolic was affected more than the systolic. At the same time, renal plasma flow was increased and renal and cerebral resistance decreased. These workers, however, had no consistent success with Apresoline when administered orally or intramuscularly.

Material and Study

Our study had a threefold purpose:

1. To determine whether Apresoline would yield satisfactory results when given orally and intramuscularly.
2. To determine whether, in outpatients who showed early, minimal signs of hypertension, the disease could be controlled satisfactorily by oral therapy.
3. To determine whether Apresoline could prevent further elevation of blood pressure during the last trimester in patients with essential hypertension.

In 380 obstetric admissions to the Robert B. Green Memorial Hospital between Sept. 1, 1952, and Dec. 31, 1952, 13 patients with varying degrees of toxemia were encountered. Of this number, 11 were selected for study. Of these, 4 had hypertensive vascular disease, 6 had pre-eclampsia, and 1 eclampsia.

While this series is small, we feel that publication is justified by the frequent beneficial results obtained in lowering the blood pressure of toxemic patients and the impressive ease and safety with which this potent drug could be administered.

In general, the use of other drugs and therapeutic measures during pregnancy and labor was avoided. Those patients who were seen prior to labor were placed on a low-salt diet. All patients received Demerol and scopolamine during labor with the exception of Case 3, who received no other medication, and Case 2, who was delivered under Heavy Nupercaine (2.5 mg.) saddle block anesthesia. Ergotrate (1/320 grain) was given intravenously after delivery of the placenta, followed by six similar doses orally. The mothers of the two stillborn infants also received stilbestrol for suppression of lactation.

Funduscopic examinations were made on those patients with the more severe toxemias by one of the authors (W. E. S.) during the first twenty-four hours of hospital admission. Gross deviations from normal were not apparent. Blood chemistry studies the morning following admission showed abnormal changes only in Case 10, a hypertensive patient. On admission, she had a blood nonprotein nitrogen of 51 and blood uric acid of 5 mg. per cent. As shown in the clinical summary and table, she exhibited a definite response to Apresoline in doses of 150 mg. every six hours (total daily dosage, 600 mg.). The depressor effect occurred at about the time that fetal movements ceased, and perhaps this could have been a factor in the blood pressure response. The drug was discontinued, however, on the second day following delivery, and the patient's blood pressure then returned to the admission levels and has remained there, although she was asymptomatic at the time of discharge.

Dosage

The 3 patients who were admitted in active labor were given 20 mg. of Apresoline intramuscularly, and 1 of these also received three 50 mg. doses

orally before delivery. Of 9 patients who received oral Apresoline, 5 required 50 mg. every six hours, 2 needed 100 mg. every six hours, and 2 required 150 mg. every six hours for effective control of blood pressure. One woman who was started on 100 mg. oral doses, became nauseated and vomited, and the drug was stopped. Otherwise, the drug was well tolerated and effective. This may indicate the advisability of starting with small doses. Two patients responded well to 50 mg. doses four times daily over periods of twenty-three and eighty-one days. The one eclamptic patient, who is more fully described later, received a total of sixteen 20 mg. intramuscular injections and seventeen oral doses of the drug.

Case Reports

CASE 6.—This 35-year-old Latin American woman, gravida v, para iv, was admitted to the hospital at the thirty-fifth week of gestation with a blood pressure of 215/110. Urinalysis showed 3+ albumin, and 2+ pitting edema was present in the lower extremities. After twenty-four hours' bed rest and observation, her blood pressure was still between 190/100 and 215/100. Apresoline, 50 mg. orally every six hours, was then started. Morning and afternoon blood pressure readings the following day were 130/70 and 122/60, respectively.

Two days later she had an attack of false labor and her blood pressure rose to 154/92. She was transferred to the labor room, and the Apresoline was inadvertently discontinued for three days. Her pressure readings during this time were between 144/90, and 158/102. After resumption of Apresoline, 50 mg. every six hours, her pressure ranged between 132/90 and 144/90 until one week later, when she went into spontaneous labor and normal male twins that weighed 3,000 grams and 2,700 grams were delivered. Soon after delivery her blood pressure was 170/100, but four hours later it was 154/84; subsequent postpartum readings were between 130/80 and 144/86. Urinalysis showed between 3+ and 4+ albumin prior to delivery. On the third postpartum day, however, it was negative. There was no history of high blood pressure with previous pregnancies.

CASE 9.—An 18-year-old Latin-American primipara was admitted at about thirty-five weeks' gestation with a history of a convulsive seizure three hours previously. She was slightly disoriented; her blood pressure was 174/110. There was 2+ pitting edema of the lower extremities. Urinalysis revealed 4+ albumin, 4+ red cells, 4+ white cells, and waxy casts. Examination of the blood showed hemoglobin, 7.1 Gm. per 100 c.c.; red blood count 3.25 million; and white blood count 12,000, with a differential count of polymorphonuclear leukocytes 82 per cent; stab forms, 1 per cent; lymphocytes, 14 per cent; and monocytes, 3 per cent. The hematocrit was 32 per cent; blood volume, 3,900 c.c. (Evans blue dye technique)[14]; nonprotein nitrogen, 37 mg. per cent; and blood uric acid, 3.4 mg. per cent.

Thirty minutes after admission, an intramuscular injection of Apresoline, 20 mg., was given. One hour later, the pressure had dropped to 126/90 (Fig. 1). It remained at normal levels for six hours and then rose to 156/88. Additional Apresoline was then given at six-hour intervals in 20 mg. intramuscular doses for the next sixty hours. Blood pressure during this period did not rise above 134 systolic and 94 diastolic.

Four hours after admission, an indwelling catheter was inserted and 200 c.c. of urine was obtained. Only a scant 5 c.c. was excreted during the next eleven hours, however, although she received 500 c.c. of whole blood and about 500 c.c. of liquid by mouth. Immediately following an infusion of 1,000 c.c. of glucose in distilled water, urinary output increased rapidly, and in the next eight hours, 325 c.c. of urine was excreted. Subsequently, urinary output was over 1,500 c.c. for each twenty-four-hour period, varying with intake of liquids.

Beginning on the fourth day after admission, Apresoline was given orally, one 50 mg. tablet every six hours. This dose was inadequate to maintain a safe blood pressure level and was therefore increased to 100 mg. every six hours. On this dosage, the patient's pressure was fairly stable, remaining below 144 systolic and 94 diastolic until the onset of labor. Her general condition was good.

On the seventh day after admission, she went into spontaneous labor. Her blood pressure gradually increased, and later in the day she began vomiting. Intramuscular Apresoline was begun at three- to six-hour intervals for three doses. The blood pressure dropped from 160/90 to 134/100 after the full dosage became effective, near the time of delivery. Seconal, 100 mg., was given, and later Demerol, 100 mg., with scopolamine, 0.3 mg., during labor. After a labor of fifteen and one-half hours, a normal premature infant that weighed 2,200

ECLAMPTIC PATIENT (CASE 9) TREATED WITH APRESOLINE

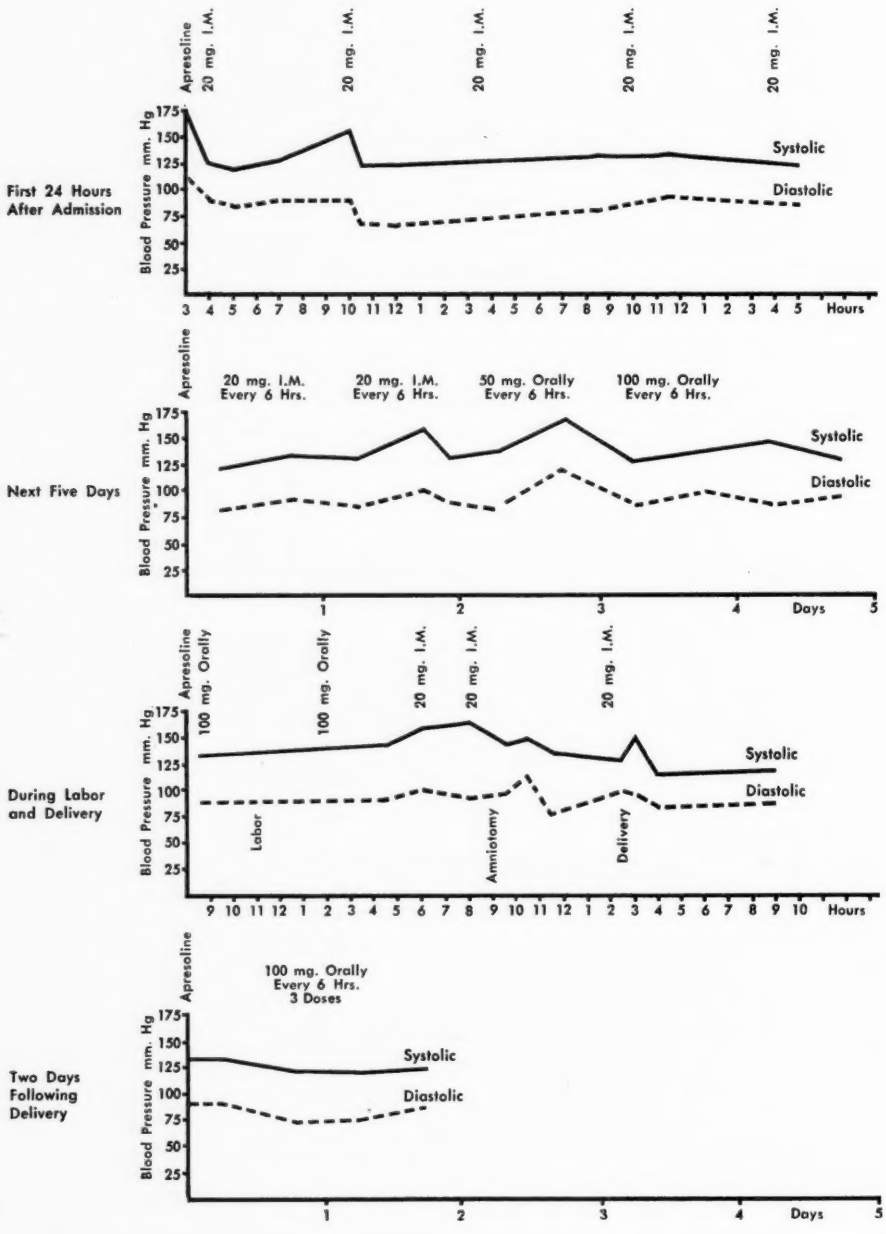

Fig. 1.

grams was delivered. The placenta showed extensive infarction. Five per cent glucose in distilled water was given intravenously during labor to increase the urinary output, which had dropped due to the vomiting.

The postpartum course was uneventful, and Apresoline, 100 mg. every six hours, was continued for a total of three doses. During the first two days post partum, blood pressure readings were between 118/84 and 148/96.

Thus, in this eclamptic patient, blood pressure was maintained within safe limits for eight days before delivery as well as during labor. Urinary output improved and was quite satisfactory during this period.

CASE 10.—A 40-year-old Latin-American woman, gravida iv, para iii, was admitted to the hospital at about twenty-seven weeks' gestation with a blood pressure of 180/120. Crepitant basal pulmonary râles were present; her pulse was 130. In the lower extremities, 2+ edema was present. She had dyspnea, headache, 4+ albuminuria, and electrocardiographic evidence of auriculoventricular bundle branch block. She gave a history of cardiac failure after her last baby had been born. She was given digitalis powdered leaf, 1½ grains daily. On the two days following admission, her blood pressure was between 188/135 and 174/135. On the fourth day, Apresoline was begun, starting with 25 mg. orally every six hours. The dosage was gradually increased without noticeable effect on the blood pressure until 150 mg. every six hours was given. On the following day, fetal movements ceased. A blood pressure of 162/92 was recorded on that date. Subsequent readings did not exceed 144/88 except during labor, which began spontaneously on the thirteenth hospital day. The pressure rose to 188/110 during labor. Intravenous alcohol, 7 per cent, in 5 per cent glucose and distilled water, according to the technique of Chapman and Williams,[4] was given for sedation during labor. The patient delivered a stillborn, 1,700 gram female infant.

Following delivery, two doses of Apresoline were given, 150 mg. every six hours, and the drug was then discontinued. The blood pressure during the first five days post partum varied from 152/100 to 188/114 just prior to discharge.

Results

As can be seen from an analysis of Table I, which summarizes the data on all 11 cases, Apresoline frequently proved to be a highly satisfactory drug in patients with essential hypertension and in those with pre-eclampsia and eclampsia. All patients exhibited significant falls in either systolic or diastolic pressure. In 9 of the 11, a desirable depression in both systolic and diastolic pressures occurred. The average maximal fall was 37/33 mm. Hg. In the toxemic group, the average fall was 43/26, whereas in the 4 patients with essential hypertension, the average decrease was 29/29. These results are similar to those of Assali and his associates, in that toxemic patients have greater reduction of pressure than do those with pre-existing hypertension. Also, there was a greater effect percentage-wise on the diastolic pressure than on the systolic.

Our findings demonstrate, in addition, the value of orally and intramuscularly administered Apresoline. Rather dramatic clinical responses were noted in 5, or almost one-half, of our patients. At the time of maximal response to Apresoline, the average depression of blood pressure in these cases was 50/42 mm. Hg.

Side effects in this series did not constitute a problem since only one patient (started on a dose of 100 mg.) was unable to tolerate Apresoline. Perhaps if this patient had been started on a smaller dose with gradual increase, the drug would have been tolerated in her case also.

TABLE I. SUMMARY OF THE EFFECTS OF APRESOLINE ON ELEVEN CASES OF HYPERTENSION AND PRE-ECLAMPSIA

CASE	DIAGNOSIS	EDEMA	URINALYSIS	BLOOD PRESSURE RANGE BEFORE APRESOLINE	EFFECTIVE DOSAGE	BLOOD PRESSURE RANGE DURING APRESOLINE	DURATION OF THERAPY	REMARKS
1.	Hypertension	1+	Negative	160/82-170/100	50 mg. orally q. 6 h.	144/94-138/90	81 days	Past history of hypertension with pregnancy. Membranes ruptured prematurely with bleeding. Normal premature female delivered
2.	Severe pre-eclampsia	Trace	Albumin: trace Pus cells: 30-60/hpf	185/110	20 mg. intramuscularly	188/44	Single injection	Seen first in active labor. Delivered normal female under saddle block. Hypertension 174/94 developed post partum
3.	Hypertension	0	Negative	158/102	20 mg. intramuscularly; 100 mg. orally q. 6 h.	144/70	Single injection; 3 oral doses	Delivered normal term female. Unable to tolerate Apresoline because of nausea and vomiting. Pressure rose sharply when labor began
4.	Severe pre-eclampsia	3+	Albumin: 2-4+ RBC: 4+ WBC: 4+ Granular casts	180/130	150 mg. orally q. 6 h.	140/86-148/104	20 days	Severe headache on admission and for 24 hours thereafter when blood pressure was 180/114. Then Apresoline was started orally. Twenty days later a macerated, stillborn, 1,500 gram premature infant delivered
5.	Severe pre-eclampsia	2+	Albumin: 3+ RBC: 4+	174/110-146/84	50 mg. orally q. 6 h.	140/70-140/90	23 days	Admitted after 16 days of therapy because of headaches, blurred vision, and hypertension. Despite depression of blood pressure, she seemed clinically worse. Membranes were ruptured, and she delivered a normal 3,850 gram male

6.	Severe pre-eclampsia	2+	Albumin: 2-4+ RBC: 4+ WBC: 4+ Finely granular casts	190/100	50 mg. orally q. 6 h.	132/90-144/90	8 days	Admitted when first seen. Blood pressure 24 hours later 215/114. Apresoline then given for 8 days, until she spontaneously delivered normal twin males
7.	Mild pre-eclampsia	0	Albumin: trace-1+ WBC: 30-40/hpf	164/128	20 mg. intramuscularly; 50 mg. orally q. 6 h.	144/94-134/96	Single injection; 3 oral doses	Admitted in active labor. Spontaneously delivered a normal, term, 4,500 gram female but had 600 c.c. postpartum hemorrhage
8.	Mild pre-eclampsia	0	Albumin: 2+	170/90	20 mg. intramuscularly	154/84-145/80	Single injection	Admitted in active labor. Spontaneously delivered a normal, term, 2,200 gram male
9.	Eclampsia	1-2+	Albumin: 4+ RBC: 4+ WBC: 4+ Waxy casts	174/110	20 mg. intramuscularly q. 6 h.; 100 mg. orally q. 6 h.	124/70-160/120	10 days	See Fig. 1
10.	Hypertension with pre-eclampsia	2+	Albumin: 4+ Waxy and finely and coarsely granular casts	188/130	150 mg. orally q. 6 h.	144/78-162/92	12 days	Admitted with mild congestive heart failure and chronic hypertension with superimposed pre-eclampsia and right auriculoventricular bundle branch block. Digitalized and Apresoline given with good results, but delivered stillborn premature 1,700 gram infant
11.	Hypertension	0	Albumin: trace WBC: 4+	164/84-158/84	50 mg. orally q. 6 h.	128/60-160/80	3 days	After 36 hours in hospital, blood pressure still 164/84. Apresoline started orally. Labor induced by amniotomy; normal, term, 3,500 gram male delivered

Of the 12 infants delivered, 10 were perfectly normal, although 2 were premature. Two were stillborn and weighed only 1,500 and 1,700 grams.

Case 5 was of interest because she showed good lowering of blood pressure during twenty-three days of Apresoline therapy but nonetheless appeared to be getting worse clinically. Because of headache, blurred vision, and increasing albuminuria and oliguria, labor was induced and she delivered a normal male infant weighing 3,850 grams.

The case of true eclampsia was well controlled by injections of Apresoline, 20 mg. every six hours, during the first three hospital days. When the patient was placed on oral Apresoline, increasingly larger dosages of from 50 to 100 mg. every six hours were required to maintain control. With the onset of labor, the intramuscular route was again employed with good response. During the ten days that she received Apresoline, there was no suggestion of another eclamptic episode and she was essentially asymptomatic. On discharge from the hospital, she had no abnormality of blood pressure or urine.

Summary and Conclusions

1. Apresoline appears to be a safe and dependable drug for use in preeclampsia and eclampsia. In addition to reducing the blood pressure in these cases, it also lowers blood pressure in patients with essential hypertension complicating pregnancy.

2. In our experience, both the intramuscular and oral routes of administration may be employed, although during labor injections seem more effective.

3. The drug administered intramuscularly and/or orally in doses of 20 mg. by injection or up to 150 mg. every six hours by mouth produced an average fall in blood pressure of 36/33 mm. Hg. When given orally, doses of less than 150 mg. seem inadequate to control the hypertension in chronic hypertensive disease.

4. Apresoline was well tolerated in every case except one. No serious side reactions occurred.

5. Because of the relative inadequacy of other methods of treatment, our results, as well as the experience of others, seem to indicate the desirability of an extensive trial of Apresoline in the hypertensive diseases associated with pregnancy.

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AN EVALUATION OF PROTOVERATRINE* IN TOXEMIA OF PREGNANCY

A Preliminary Study

PHILIP J. KRUPP, B.S., M.D., CHARLES FARRIS, JR., B.A., B.S., M.D., CHARLES F. PIERCE, B.S., M.D., AND ADOLPH JACOBS, B.S., M.D., F.A.C.S., NEW ORLEANS, LA.

(From the Independent Unit, Division of Obstetrics and Gynecology, the Charity Hospital of Louisiana, New Orleans)

TOXEMIAS of pregnancy account for the largest number of maternal deaths in the United States,[1] and until the etiology can be exactly determined treatment must be symptomatic. Any therapy must allow for homeostasis while combating the pronounced vasospasm so characteristic of this disease.

In the past our management of the hypertensive toxemias centered around heavy sedation with morphine, barbiturates, and magnesium sulfate. Absolute bed rest, fluids intravenously and orally amounting to output plus insensible loss, salt-free, high-protein diet, judicious evacuation of the uterine contents when the clinical course became "stabilized," and symptomatic care including nasal oxygen were the other important aspects of our concept of treatment. Apresoline (1-hydrazinophthalazine hydrochloride) has also found limited use. Because of the slight but definite decrease in urinary output caused by morphine[2, 3] and by the lowered respiratory rate of a heavily sedated, toxic patient in whom adequate oxygenation is vital, we began a critical evaluation of our mode of therapy. Of no small concern was the pooling of secretions in the respiratory tree—at times requiring tracheotomy[4]—and the difficulty in caring adequately for patients unable to cooperate. Infants born of these toxic patients were often somnolent themselves, making resuscitation difficult and their early hours critical.

Three years ago, stimulated by Assali's work,[5, 7] one of us (P. J. K.) gave an early preparation of *Veratrum viride* a clinical trial at this hospital. The frequency and degree of toxic reactions (nausea, emesis, bradycardia, shock, and paresthesias) caused us to discontinue its use until a more purified preparation could be obtained.

In July, 1953, a highly purified substance, PVS-295, was made available to us. PVS-295 is the research designation of the protoveratrine so supplied (Puroverine), and consists of the pure crystallized alkaloids of *Veratrum album* in a constant ratio of protoveratrine A (2/3) and protoveratrine B (1/3). We used both the tablets (0.25 mg.) and a parenteral solution (1 c.c. ampules, 0.1 mg.) and have now evaluated protoveratrine in 41 consecutive cases.

*The protoveratrine employed in this study was PVS-295 (Puroverine), supplied by Sandoz Pharmaceuticals.

The pharmacologic action of protoveratrine has recently been investigated by Hoobler and Corley,[8] who confirmed Meilman and Krayer's[9] studies, and found protoveratrine to conform to the general pattern of Veratrum preparations[10, 11]:

1. Depressor.—

(a) The main component of this blood pressure lowering action is due to vasodilation (decreased peripheral resistance) demonstrable with the plethysmograph.[9] This action is reflex in nature with the receptors of the afferent arc primarily in the left ventricle[12] and impulses travel to cerebral circulatory regulating centers via fibers in the vagus nerves. Atropine does not block this arc. The efferent arc follows autonomic ganglionic pathways since the depressor action can be blocked by tetraethylammonium compounds.[6, 13]

(b) There is some evidence for a central effect[10, 14] but Taylor[15] states that protoveratrine failed to inhibit the action of cerebrotonin.

2. Bradycardia.—

This too appears to be a reflex action with the afferent arc as stated above. The efferent arc can be blocked by atropine or by severing the vagus nerve and is therefore considered to be vagal. If pronounced, it can augment the hypotensive effect, apparently by decreased cardiac output.[8, 10]

3. Pressor and Cardioaccelerator Action.—

This action is apparent only with large doses in experimental animals, and it seems to be due to the release of epinephrine.[10] Thus far it has not been reported in human studies.

Methods and Materials

All 41 cases studied were ward patients and consecutive admissions in whom a diagnosis of toxemia of pregnancy had been made. Of this group there were 37 with pre-eclampsia (13 mild and 24 severe cases), 3 with eclampsia, and one hypertensive patient with superimposed pre-eclampsia. In addition to these, 5 cases of pre-eclampsia were deleted from this study because residents unfamiliar with our changed routine gave one or more doses of a sedative to these patients on admission, thereby making evaluation of the PVS-295 in these instances impossible. Two additional patients with antepartal fetal deaths on admission were also deleted. Protoveratrine was used in these seven patients, however, and all had a favorable response.

The subjects of this study were treated with bed rest, salt-free and high-protein diet, fluids, and PVS-295 only. No other drugs were used to control the signs and symptoms of the disease (except in the one case cited later). Vaginal delivery was effected with pudendal block and there were four cesarean sections. Five patients were controlled well enough to be discharged to the Toxemia Clinic, undelivered. Routine studies consisted of fundoscopic examinations, blood typing and serology, hemoglobin levels, daily urinalysis, blood urea nitrogen, uric acid, and urea clearance tests, serum protein levels, electrocardiogram, and blood pressure, pulse, and fetal heart tone determinations at frequent intervals. Fluid intake and output were recorded at least every eight hours.

Because of the rapid turnover of patients at our hospital, they were all started with protoveratrine as soon after admission as possible. PVS-295 was administered orally and intravenously and blood pressure and pulse determinations done every five minutes until stabilized at a desired level. Rapidity of response and toxic effects were noted. Urinary output was carefully observed.

Method of Administration

We found that individualization of each patient's response is important. Mild cases of pre-eclampsia were treated usually with oral medication (0.5-1.0 mg. every four hours). Patients with severe pre-eclampsia received 1 mg. orally on admission along with 0.2 mg. in 1,000 c.c. of a 5 per cent dextrose solution in distilled water intravenously dripping at a rate of 30 drops per minute. If an inadequate response was obtained in thirty minutes the rate of infusion was increased. If the response was still not adequate an additional 0.1 mg.-0.2 mg. was given slowly directly into the infusion tubing while blood pressure and pulse were closely observed (every two to three minutes). We attempted to lower blood pressure to approximately 140/90 in severe pre-eclampsia. One must remember that while the blood pressure begins to fall immediately, the maximum response is delayed for about thirty minutes. In refractory individuals 0.1 mg. intravenously may be repeated as necessary. The oral dose is given every four hours. Eclamptic patients in general required more vigorous use of the drug under study. The average duration of therapy in all cases was seven days, although one patient was given PVS-295 for nineteen days.

Results

In general the more severe the toxemia, the more protoveratrine was needed initially for control. In all patients blood pressure was regulated at a desired level by this regimen (except the case reported hereafter). Those individuals with albuminuria (11 cases) and edema (22 cases) gave evidence of a steady decline in amount once treatment had been started. Of the 41 cases studied, urinary output charts were available in 28; and in these 28, at the end of the first twenty-four hours of therapy, there was no output less than 400 c.c. Average output was 1,749 c.c. Chart I illustrates a typical response in severe pre-eclampsia.

In one case although blood pressure, edema, and albuminuria subsided, the blood urea nitrogen and uric acid showed a steady rise. Induction was therefore indicated, and when induction failed the patient was delivered uneventfully by low cervical section under local anesthesia. All patients, including those with eclampsia, were controlled on PVS-295, bed rest, and fluids. There were no convulsions in any patient, once specific treatment had been initiated, except the following case:

This 24-year-old Negro patient, gravida ii, para i, unregistered, 28 to 30 weeks pregnant, was seen in the Admitting Room semicomatose with a history of eight convulsions at home in the past twelve hours. Her blood pressure was 170/120. There was no edema, but a 4 plus albuminuria was present. Her previous pregnancy was terminated in July, 1952, by low cervical section for eclampsia and essential hypertension. While in the Admitting Room another convulsion began and sodium Amytal, 0.5 Gm., was given intravenously. Once she was in the delivery unit, protoveratrine, 0.2 mg. in 1,000 c.c. of 5 per cent dextrose in distilled water, was started intravenously. Forty minutes later the blood pressure had fallen to 148/118 and in one hour it was 134/92. The pulse rate was 48. Despite this favorable initial response the pressure began to rise and there was another convulsion. With the patient in critical condition the doctor on call resorted to the therapy with which he was familiar, and morphine sulfate, ¼ grain, sodium Amytal, and magnesium sulfate were given. The patient did not improve and twelve hours after admission tracheotomy was necessary in this now heavily sedated patient. After thirty-six hours of lack of improvement the patient was delivered by low cervical section under local anesthesia of a 2 pound viable fetus. The mother had a rapid uneventful recovery, while the infant died five days after delivery.

Comment.—Protoveratrine was not given an adequate trial in that only a minimal dose was used in this case. Because this was the only patient in the series not controlled, however, the case report is included.

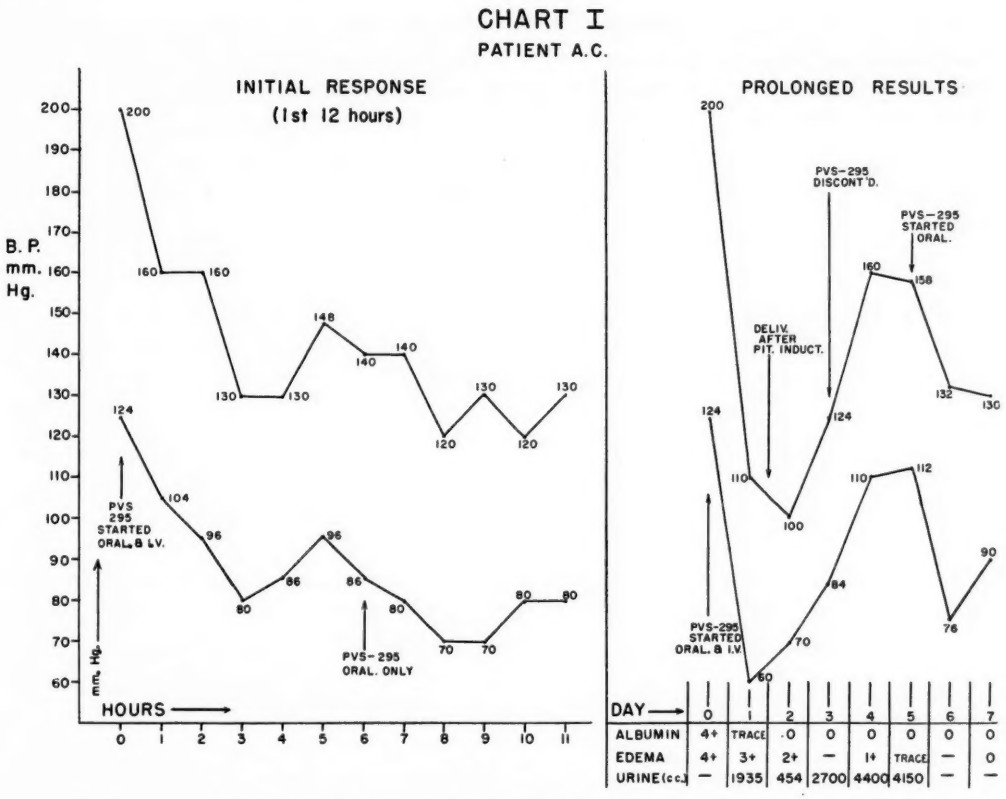

Chart I.—A. C. These graphs show the immediate and over-all results in patient A. C., who received PVS-295, 0.2 mg. intravenously in 1,000 c.c. of 5 per cent dextrose in water on admission, and 1.0 mg. orally every 4 hours. Pitocin induction approximately 24 hours after control was successful and delivery uneventful. Protoveratrine was discontinued on the third postpartum day, but had to be reinstituted on the fifth postpartum day to control still significant hypertension.

Toxic effects were infrequent and not severe, with a moderate degree of nausea and vomiting in 12 cases. Since this was especially noted with oral doses and since it was relieved by Amphogel, gastric irritation is probably a factor. Bradycardia, present in 6 cases, was abolished by atropine, 1/150 grain. Marked hypotension developed in one patient (blood pressure 76/50) on oral medication. Ephedrine, epinephrine, or Levophed is indicated to combat this effect; in this case, however, merely halving the amount of protoveratrine was enough to end the episode of hypotension. There were no maternal or fetal deaths attributable to PVS-295 (Table I).

TABLE I. TOXIC EFFECTS IN 41 CASES

	%	REVERSIBLE
Nausea and vomiting	29.2	Yes
Bradycardia	14.6	Yes
Marked hypotension	2.4	Yes

Worthy of note here is that Apresoline seems to act antagonistically in the protoveratrine-controlled pre-eclamptic patient. While we have controlled pre-eclamptic patients with Apresoline alone, we have also obtained a pressor response when this drug was given to protoveratrine-controlled patients. In 3 of our patients who were stabilized on PVS-295, test doses of Apresoline were given and blood pressure rose to approximately pretreatment levels or higher (Chart II).

In our experience, therefore, the two drugs are not to be used together until further studies clarify their actions. This seems to be at variance with the findings of McCall[14] who has recorded satisfactory results with a mixture of Apresoline and Veratrum.

CHART II

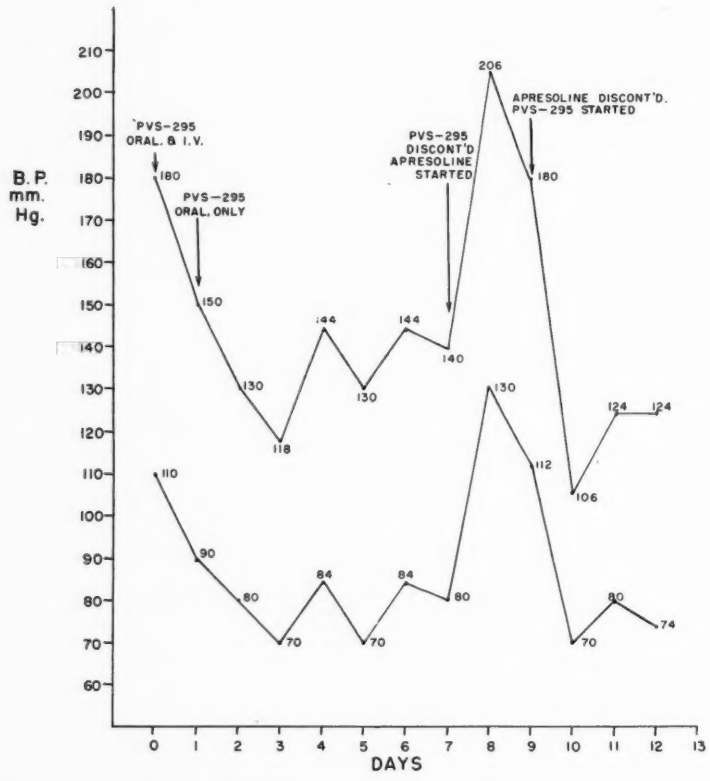

Chart II.—I. H. This patient was well controlled on PVS-295. After seven days of regulation PVS was discontinued and Apresoline, 100 mg. every 6 hours, given orally. A pressor response became evident and after 48 hours Apresoline was discontinued. PVS, 1 mg. every 4 hours, was given again and the blood pressure response was dramatic.

Comments and Conclusions

The protoveratrine here used was a potent but safe drug when administered properly. Its advantages make it a valuable addition to our armamentarium in the treatment of the hypertensive toxemias of pregnancy. It causes rapid control of the most prominent features of the disease as evidenced by regression of hypertension, edema, and albuminuria without heavy sedation or interference with the individual's homeostasis. Because it decreases peripheral resistance (vasospasm), there is evidence to show that there is better oxygenation of tissue.[14] Patients are conscious and cooperative and there is no pooling of secretions in the respiratory tree. Toxic effects are not frequent and are usually easily reversed. In no instance was there evidence of tolerance developing to the drug and prolonged therapy is possible, if indicated.

This drug, however, is in no way recommended to supplant careful observation, clinical judgment, and evacuation of the uterus in the treatment of toxemia of pregnancy, but rather as a means of control until delivery can be effected by the proper procedure with safety.

At this time, Apresoline and protoveratrine are not recommended to be used in combination because of the apparent antagonistic effect demonstrated in this small series.

Summary

1. Protoveratrine (PVS-295; Puroverine) is a potent but safe drug when properly used in toxemia of pregnancy.

2. It is the most rapid and effective drug which we have used to lower the blood pressure in this disease.

3. Toxic reactions are not frequent and are usually easily controlled.

4. There were no maternal or fetal deaths attributable to the drug.

5. The patients remained conscious and adequately oxygenated with this routine.

6. There was no pooling of secretions in the respiratory tree in any of the patients treated with PVS-295 only.

7. There was no respiratory depression of the mother or the fetus.

8. No tolerance to the drug was demonstrated.

9. Apresoline should not be given to patients stabilized on protoveratrine.

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A DISCUSSION OF POSTPARTUM STERILIZATION*

T. M. Boulware, M.D., F.A.C.S., C. D. Howe, M.D., and S. T. Simpson, M.D.,
Birmingham, Ala.

(From the Department of Obstetrics, Carraway Methodist Hospital)

THERE is rather general professional agreement that a few medical complications render subsequent pregnancy so hazardous as to warrant surgical sterilization. There exists, however, considerable disagreement regarding many borderline medical and socioeconomic indications for such operations. Some hospitals prohibit these operations and others are probably too liberal. Inasmuch as surgical sterilizations are becoming of increasing concern to many hospitals, an evaluation of this subject seems to be timely.

In an attempt to secure facts and representative opinions concerning indications, controls, and incidence of postpartum sterilizations, we sent questionnaires to 100 reputable hospitals conducting approved residency training programs. For obvious reasons we excluded certain hospitals whose religious beliefs do not permit sterilization. Our discussion thus concerns our own ideas and those expressed by 100 approved hospitals.

A summary of our questionnaire findings appears in Table I, only unequivocal replies being tabulated.

Medical Indications

The 84 affirmative replies to Question 1 of the survey indicate professional opinion relative to the validity of definite medical indications for postpartum sterilization.[1] Such indications may include the following: (a) selected cases of organic heart disease; (b) selected cases of cardiovascular-renal disease; (c) some cases of severe chronic pyelonephritis; (d) multiparity with severe chronic hypertensive vascular disease.[2]

Less definite medical indications should include: (a) severe diabetes in selected multigravidas; (b) multiple cesarean sections (although there is some diversity of professional opinion, Question 2 of the survey indicates that most obstetricians favor sterilization after a third cesarean section); (c) gross multiparity (para viii or more).

Socioeconomic Indications

Replies to Question 3 indicate opinions equally divided about such indications. Frank discussion of this matter is usually avoided at hospital staff meetings and little appears in the literature about it. If the attending obstetrician has definite opinions on such indications, it should be his privilege to express them.

*Presented at a meeting of the Birmingham Obstetrical and Gynecological Society, Jan. 14, 1954.

One may ask, however, whether a request for postpartum sterilization by a couple of rather low economic status with four living children should be dismissed in summary fashion just because the mother still enjoys reasonably good health at the moment. What may be the future physical, educational, and social repercussions in this family if unlimited progeny overtax the family budget? Do we, as physicians, have the right to make such decisions even though we are so requested? These are pertinent questions worthy of careful evaluation.

Tabulations on Question 4 indicate overwhelming disapproval of postpartum sterilization of any patient under 30 years of age without strict medical justification. Flagrant disregard of this sane policy is not a rarity.

At the risk of incurring professional criticism we present the following formulation of a general policy for your consideration:

A. Postpartum sterilization may be considered, if requested, provided the mother is at least 30 years of age with 4 living children.

B. Postpartum sterilization may be justified in selected cases of mental inadequacy.[3, 4] Each year our local health agencies are confronted with the problem of mental defectives who periodically reproduce offspring of doubtful paternity. Should such persons be permitted to reproduce social and economic liabilities indefinitely? Some of us would answer in the negative.

TABLE I. QUESTIONNAIRE FINDINGS

1. Does your hospital permit female sterilization by tubal ligation and/or resection for definite medical indications?		
	YES (84)	NO (0)
2. In general, would you sterilize a patient at time of:		
(a) a second cesarean section		(7)
(b) a third cesarean section		(53)
(c) a fourth cesarean section		(10)
3. Does your hospital permit postpartum sterilization for socioeconomic indications?		
	YES (38)	NO (36)
4. In general, would your hospital permit sterilization, for nonmedical reasons, of any patient under 30 years of age?		
	YES (8)	NO (73)
5. Do you feel that postpartum sterilization carries any risk to the physical, mental, or emotional future welfare of such patients?		
	YES (34)	NO (45)
6. Does your hospital exercise any staff control over postpartum sterilizations?		
	YES (70)	NO (13)
7. Staff control is exercised by:		
(a) special staff committee		(29)
(b) "tissue committee"		(2)
(c) any three staff members		(39)
(d) judgment of the surgeon		(13)
8. What is the incidence of postpartum sterilization in your hospital?		
	1.7% of all viable births (average)	
9. Is it your feeling that too many postpartum sterilizations are now being done in your hospital?		
	YES (19)	NO (59)

Dangers to Future Health

Does sterilization by tubal ligation actually jeopardize the future physical or mental health of such patients? In spite of some professional expressions to the contrary, we cannot visualize any possible physical ill effects from mere tubal resection. It is quite conceivable however, that simple knowledge of induced sterility could have some psychic effects in later years. The age of the patient at the time of the operation could be a major factor in any such effects. Replies to Question 5 show that 43 per cent of hospitals interrogated had some fear of physical or psychic ill effects. Such expressions of opinion must have some basis in fact or reason. Although none of our own patients have yet requested that their tubes be untied, a full and understandable explanation of the operation should be carefully given the patient and her husband before surgery.[5]

Hospital Controls

There are two occasions for surgical sterilization in the female, (1) postpartum sterilization within 24 hours after normal delivery or at the time of cesarean section, and (2) surgical sterilization unassociated with recent pregnancy but incidental to other surgery. The obstetrician who carelessly approves every request for postpartum sterilization is no more guilty of incorrect practice than is the surgeon who seeks an indication for laparotomy when the sterilization element is the real reason for surgery. As an example of laxity we cite the case of a recent patient whose request for postpartum sterilization we refused about a month prior to her estimated date of confinement. Following our refusal, a telephone call by this patient to a local colleague obtained his immediate promise to perform the desired operation.

With such inconsistencies of professional opinion and hospital supervision, it appears logical for each hospital to activate some method of control over all postpartum sterilizations.[6] The various inspection and accreditation groups are becoming increasingly aware of this problem. Question 6 indicates that most approved hospitals already exercise some staff control over postpartum sterilizations; Question 7 suggests that the two most common methods of control are by prior written approval of any three staff members or by a special staff committee.

It is our own belief that a carefully selected and representative staff committee can best effect control over postpartum sterilizations and therapeutic abortions with a minimum of friction or controversy. We also suggest that a psychiatrist and internist be included in the membership of this committee. A properly functioning "tissue committee" may be relied upon to make careful inquiry into all sterilizations other than postpartum ones.

Incidence

There have been few published data relative to actual incidence of this operation. Replies to Question 8 enabled us to figure incidence in terms of percentage of viable births that were followed by postpartum sterilization.

Hospitals reporting these data had incidence rates which varied from 0 to 7.2 per cent; the average incidence was 1.7 per cent. These representative figures suggest that any incidence above 3.0 per cent could well merit careful analysis by the hospital concerned. We do not imply that this figure should always be the yardstick of comparison because variable local factors may well increase the incidence in some hospitals. Some reasonable incidence figure will doubtless be eventually agreed upon by the proper accreditation group. Question 9 indicates that 24 per cent of hospitals queried felt they permit too many postpartum sterilizations.

Legal Considerations

The actual legal aspects of surgical sterilization are not the concern of this study. States have varied laws relating to such operations[7, 8, 9] and some states require a prior court order. Strictly speaking, laws of most states afford little protection for a surgeon who performs surgical sterilization. Reliable legal advice in Alabama suggests that any jury here would be most unlikely to censure such a surgeon if there was a clear medical reason for the sterilization. The legality of a sterilization for nonmedical indications is most questionable and 100 per cent protection is not afforded by any operative permit. Such facts emphasize the importance of adequate hospital records.

Data From Carraway Methodist Hospital

Data from Carraway Hospital is probably fairly representative for a 250 bed general hospital. Five of our patients were referred from County Health Department antenatal clinics because sterilization could not be effected at the local "city hospital." Our Obstetric Staff consider the modified Pomeroy operation to be simple, bloodless, and effective. During the period Oct. 1, 1951, to Oct. 1, 1952, there were 1,733 viable births and 43 postpartum sterilizations (Tables II and III). This gave an incidence of 2.4 per cent which is a little too high.

TABLE II. MEDICAL INDICATIONS AT CARRAWAY METHODIST HOSPITAL

Repeat cesarean section	7
Chronic hypertensive vascular disease	9
Cardiovascular renal disease	5
Organic heart disease	3
Erythroblastosis fetalis	1
Extensive vaginal plastic	1
Esophageal stricture	1
Uterine rupture, repaired	1
Total	28

TABLE III. SOCIOECONOMIC INDICATIONS AT CARRAWAY METHODIST HOSPITAL

Multiparity		12
Para iii	2	
Para iv	1	
Para v	3	
Para vi	1	
Para vii	2	
Para viii	3	
Mental deficiency		3
Total		15

Summary

1. The valid indications for postpartum sterilization merit frank evaluation, discussion, and clarification.

2. Opinions are about equally divided as to socioeconomic justification for this operation.

3. There is considerable concern as to the possible future psychic effects of these operations.

4. A majority of opinions expressed favored sterilization after three cesarean sections.

5. Few hospitals permit postpartum sterilization for nonmedical indications of any patient less than 30 years of age.

6. Hospitals should exercise adequate staff control over all postpartum sterilizations.

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1529 NORTH 25TH STREET

POSTDATE LABOR: EFFECTS ON MOTHER AND FETUS*

ISIDORE DAICHMAN, M.D., F.A.C.S., AND EDWIN M. GOLD, M.D., F.A.C.S.,
BROOKLYN, N. Y.

(From the Department of Obstetrics, Jewish Hospital of Brooklyn)

WE are at present in that era that is considering ways and means to combat fetal wastage. It is acknowledged that prematurity is the leading cause of fetal mortality. Investigation of the problem of prematurity is widespread. Little or no thought has been given to postmaturity in this regard. In the interest of achieving greater fetal salvage we propose to show from our own material that the pregnancy which progresses beyond term carries no greater risk to mother or fetus than the pregnancy of normal duration. Also, that the term postmaturity per se is a dangerous one; that it by connotation leads to undue interference by induction of labor, which in turn may probably be the reason for poor maternal and fetal results. We propose to drop the term postmaturity. In its stead we suggest the term "postdate labor," which we feel should be managed no differently than labor in pregnancies of normal duration.

Postmaturity is difficult to define. Nowhere in the obstetric literature does there exist an acceptable definition or criterion for postmaturity such as is accepted for prematurity. Rudolph Holmes[1] has stated, "In my opinion postmaturity is a figment of the imagination." Calkins[2] agrees with this opinion. Latto[3] in a recent paper on this subject purposely avoided the term postmaturity because it implied a pathological state.

The Duration of Pregnancy

Common usage concedes a pregnancy to be prolonged in which labor ensues 295 or more days from the date of the last regular menstrual period in normally menstruating women whose cycles are rhythmic. In other words, we clinically accept prolongation of pregnancy in those cases where labor ensues 15 or more days beyond the expected date of confinement as calculated by Naegele's rule.

The clinician is quite aware of the vagaries entering into the calculation of the date of expectancy from Naegele's rule. Recently, doubt has been cast upon the validity of the duration of pregnancy calculated from this rule by Tompkins[4] and Stewart[5] in separate communications. Both these authors, by application of basal temperature recording techniques, show the duration of pregnancy to be actually 266 to 270 days. In their own series, if computations of duration of pregnancy were made by Naegele's rule alone, the pregnancies would have lasted as long as 349 days, the conclusion being that abnormally

*Presented at a meeting of the Brooklyn Gynecological Society, Oct. 21, 1953.

long gestations are due to delayed ovulation and subsequent fertilization. Stewart,[5] quoting Ahlfeld who reported on the duration of pregnancy as calculated from a single coitus, showed a duration of pregnancy range from 231 to 329 days. Where the date of menstruation as well was known, the range of duration of pregnancy was 243 to 295 days.

Mean durations of pregnancy, whether computed from coitus to birth, ovulation to birth, or from the date of the last regular menstrual period, range between 266 and 273 days.[4-9] Thus, for practical purposes, clinical usage of Naegele's rule for computation remains most feasible.

Uncertainty surrounds the pregnancy that progresses beyond the expected date of confinement or 280 days, by Naegele's rule. The clinician is fearful of the possibilities of unexplained antepartum intrauterine fetal death, dystocic labor, excessive size of the fetus, and higher incidence of operative delivery with resultant increases in maternal and fetal morbidity and mortality. So ingrained is this clinical fear that numerous articles have appeared advocating induction of labor by various methods to terminate these pregnancies.

Clinical Material

The material to be presented consists of 123 pregnancies that had a duration of 295 or more days as calculated from the date of the last regular menstrual period. These cases occurred in a total of 4,673 consecutive deliveries performed at the Jewish Hospital of Brooklyn during the calendar year 1949. Only those patients with known date of last regular menstrual period who were normally and rhythmically menstruating were included.

The incidence of postdate labor in this series was 2.6 per cent. Table I shows the marked variations in incidence of postdate labor reported in the literature in comparably studied series, ranging from a low of 2.0 per cent to a high of 31.72 per cent. The current series is the second lowest in incidence reported. Since it has been pointed out that the mean duration of pregnancy is almost the same (266 to 273 days) whether computed from date of the last regular menstrual period, ovulation to delivery, or coitus to delivery, it is our feeling that the marked variations in incidence of postdate labor noted are ascribable to the variations in criteria used. Where the criterion of 285 to 294 days is used, the incidence range is from 24.1 per cent to 31.7 per cent (exclusive of Boe's[14] series). Where the criterion of 295 or more days is used, the incidence range is from 2.6 per cent in the current series to 9.6 per cent in Lartz's[15] series. Eastman[19] has stated that "in over 3 per cent of patients labor does not ensue until three or more weeks after the calculated date."

Of passing interest is the higher incidence of postdate labor in the private patients (3.0 per cent) compared to the ward patients (0.50 per cent) in this series as shown in Table II. No explanation for this finding is offered, other than possibly the smallness of the series as a whole.

The study group of cases was comprised of 74 primiparous and 49 multiparous patients, which is in general agreement with the increased number of primiparas having postdate labor in the literature.

The Mode of Delivery

The mode of delivery in the 123 patients in this series is shown in Table III and reveals that 81.3 per cent were delivered either spontaneously or by low forceps. There was one breech delivery per vaginam. The cesarean sec-

tion rate of 5.7 per cent is the same as the clinic average and confirms reports in the literature that there is no increase in section incidence in cases of postdate labor.[3, 14, 15, 16]

TABLE I. INCIDENCE VARIATIONS IN POSTDATE LABOR

AUTHOR	NO. OF CASES STUDIED	NO. OF CASES POST DATE	CRITERION (DAYS POST DATE)	% POST DATE
Temesvary (1952)	18,696	5,233	285	27.8
Gibson and McKeown (1950)	17,072	5,415	287	31.72
McKiddie (1949)	6,803	1,642	288	24.1
Kortenoever (1950)	7,054	1,706	290	24.18
		955	295	13.5
		564	300	8.0
		343	305	4.86
Boe (1950)	23,264	465	290	2.0
Lartz (1953)	736	71	295	9.6
Rathbun (1943)	3,679	250	295	7.6
Clayton (1941)	9,649	705	295	7.3
Latto (1951)	4,653	171	295	3.7
Clifford (1951)	2,187	123	300	5.6
Daichman and Gold (1953)	4,673	123	295	2.6

TABLE II. INCIDENCE OF POSTDATE LABOR, JEWISH HOSPITAL OF BROOKLYN, 1949

TOTAL NO. DELIVERIES	NO. CASES POST DATE	% POST DATE
Private 3,881	119	3.0
Service 792	4	0.50
Total 4,673	123	2.6

TABLE III. MODE OF DELIVERY

MODE OF DELIVERY	NO. OF CASES	%
Spontaneous	46	37.4
Low forceps	54	43.9
Midforceps	15	12.2
Breech extraction	1	0.8
Cesarean section	7	5.7
Total	123	100.0

The midforceps rate of 12.2 per cent in this series is high compared to reported rates of 2 to 6.5 per cent in comparably studied series,[14-17] and warrants analysis. Four of the 15 midforceps were elective. The incidence of indicated midforceps is thus 8.9 per cent. Of the remaining 11 midforceps, the indications were as follows: uterine inertia 2 cases; malposition 4 cases; fetal distress 3 cases; contracted outlet 2 cases. The weights of the infants varied from 6 pounds, 1 ounce, to 9 pounds, 7 ounces; 2 of the infants weighed 9 pounds or over, both in the inertia group. One of these resulted in a stillbirth, due to disproportion (a 9 pound baby in a flat pelvis).

Similar analysis of the 7 cesarean sections reveals the following indications: elderly primiparity 1 case; breech 1 case; cephalopelvic disproportion 4 cases; postmaturity one case; all babies were under 9 pounds. The section presumably done for postmaturity was in a 22-year-old primigravida, 24 days post date, with a small gynecoid pelvis clinically. She had uterine contractions for 2½ hours with ruptured membranes and meconium-stained amniotic fluid. The baby weighed 8 pounds. From these data it appears that postdate labor per se was not an important factor in the incidence of midforceps deliveries or cesarean sections.

The incidence of prolonged labor was not found to be above normal by Calkins[2] and Lartz.[15] Boe[14] and Rathbun[16] found labor to be prolonged. Analysis of the current series finds us in agreement with Lartz and Calkins in this regard. We did, however, encounter uterine inertia in 11 of our 123 cases. These cases of inertia were responsible for two midforceps deliveries. Oxytoxic stimulation during labor was resorted to in only 5 cases, once for induction in a primipara, 27 days post date, whose total duration of labor was less than two hours. In the 4 remaining cases, the oxytoxic was administered intramuscularly once, intranasally once, and intravenously twice. Given such a group of cases of inertia today, we would resort to oxytoxic stimulation much more readily and frequently than we did in 1949.

The Weight of the Baby

Rathbun[16] has stated, "The postmature mother is faced with the problem of delivering a larger fetus than she would have delivered at term." This opinion epitomizes one of the beliefs that postmaturity causes a higher incidence of bigger babies and the attendant dystocia and morbidity problems ensuing therefrom. Fig. 1, graphing the weight distribution of the infants in the 123 cases in the current series, reveals a bell-shaped curve of distribution. Table IV, showing the range of days post date in each weight distribution group, reveals that 92 per cent of the babies were under 9 pounds and that 4 per cent of the babies were under 6 pounds. The number of days post date was relatively constant for each weight distribution group. Thus it appears reasonable to conclude that gestational age alone has no influence on fetal weight. Similar views are held by Stewart,[5] Lartz,[15] Leon,[22] and Arnot.[21] Calkins[2] has shown that if an infant is to be oversize at full term, he will have acquired most of his excessive size by the two hundred and sixtieth day of gestation; and that his further increment in size thereafter will be so little that it will make no real difference in the course of the subsequent labor. Kamperman,[20] discussing Calkins' paper, has stated that statistically the longer the postmaturity continues after twenty days, the smaller will be the baby.

The question may rightfully be asked, what is the incidence of large babies in postdate labors and how does it compare with the incidence of large babies in general? Our figures reveal an 8.1 per cent incidence of babies weighing 9 pounds or more in the current series of 123 cases of postdate labor. A study of the Vital Statistics for the City of New York for the years 1943, 1944, 1945, 1947, and 1948 revealed for those years a total of 715, 264 live births with 48,336 babies weighing 9 pounds or more, an incidence of 6.7 per cent. Thus our incidence of large babies does not show any statistically significant difference from the expectancy.

TABLE IV. THE RANGE OF DAYS POST DATE IN EACH WEIGHT DISTRIBUTION GROUP

BIRTH WEIGHT GROUP (IN POUNDS)	NO. OF CASES POST DATE	%	AVERAGE NO. OF DAYS POST DATE	RANGE OF DAYS POST DATE
5 to 5-15	5	4.0	20.3	18-23
6 to 6-15	21	17.0	18.8	14-25
7 to 7-15	48	39.0	21.0	14-39
8 to 8-15	39	31.7	20.0	14-36
9 or more	10	8.1	19.0	14-27
Total	123	99.8		

Fetal Mortality

It has been the impression of clinicians that prolonged gestation is associated with a definite increase of fetal mortality. The total fetal loss in the

current series was 3 stillbirths, one antepartum and 2 intrapartum fetal deaths, 23, 15, and 27 days post date respectively. There were no neonatal deaths. The fetal mortality rate is 2.4 per cent. This compares most favorably with the fetal mortality rates of similarly studied series reported in the literature, Lartz[15] reporting a rate of 2.8 per cent, Rathbun[16] 6.0 per cent, Clayton[17] 4.2 per cent, Latto[3] 6.4 per cent, and Kortenoever[13] 7.4 per cent. Both intrapartum fetal deaths were cases of disproportion, the babies weighing 9 and 10 pounds respectively. We feel it important to stress the fact that the incidence of babies that weighed 9 pounds or more was no greater than the normal expectancy in this weight group. The fetal loss, therefore, was due to the size of the baby and not to the gestational age.

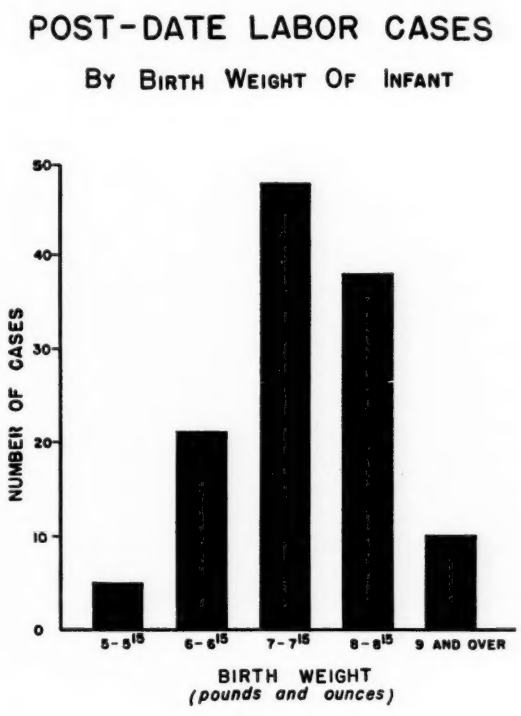

Fig. 1.

In the current series there was but one antepartum intrauterine death. Many authors[3, 14, 16] feel as we do that there is no increase in incidence of antepartum fetal death in postdate pregnancies. On the other hand, Temesvary[10] and Schwarcz and Pinto[23] find an increased incidence. It is difficult, however, to indict prolongation of gestation alone as the factor productive of antepartum intrauterine fetal death. This complication of pregnancy is found as often with premature and normal gestational cases as with postdate gestations. Latto[3] makes the point that when death of the fetus occurs before term the cause is often said to be undetermined. When death of the fetus occurs after term it is ascribed to postmaturity. In an attempt to corroborate this view he studied a series of 154 stillborn infants of all dates of gestation and found 21 had died in utero from no apparent cause. Of these 21, only one was postmature.

Temesvary[10] feels that the fetal mortality in prolonged pregnancy is considerably influenced by the high incidence of congenital malformations in his

series. Yet a breakdown of his figures reveals an incidence of monstrosity of but 1.1 per cent in 1,434 pregnancies that lasted 295 or more days. Latto[3] showed 4 monsters in 171 cases, or 2.3 per cent, and Lartz[15] had one in 71 cases, or 1.4 per cent. In the current series there were no babies born with congenital anomalies. Since the over-all incidence of congenital anomalies ranges from 1 to 2 per cent, it appears that postdate labor is not associated with an increased incidence of congenital malformation.

The question of maternal morbidity and mortality in postdate labors has been overshadowed by the concern for the fetus, since most authors on the subject fail to mention the maternal outcome. From this we assume that the maternal outcome was little different from the clinic average. Boe[14] does report an increased maternal mortality of 1.1 per cent from his clinic as well as a 41 per cent incidence of postpartum hemorrhage. On the other hand, Rathbun[16] had but one maternal death in 250 cases of postdate labors and Lartz[15] reported no maternal morbidity or mortality in his 71 cases. In our series of 123 cases of postdate labor we had no maternal deaths and a morbidity rate of 4.0 per cent including one day febrility. There was but one case of postpartum hemorrhage.

Certain authors[12, 13, 23] have advocated induction of labor in the management of these cases. A greater number of reports, however, decry the use of induction.[3, 10, 15, 16, 17] Some of the latter authors point out that the procedure itself is fraught with greater danger to mother and fetus than the condition for which it is advocated. The cervix that is long, uneffaced, and undilated, despite the prolongation of gestational age as calculated by Naegele's rule, means that the patient is not ready for labor. Attempted induction in such cases will increase maternal and fetal complications. In the current series, induction of labor for the indication of postdate pregnancy was performed in only one case, a primipara, 27 days post date, and she delivered in less than two hours. The remaining 122 patients were permitted to go into spontaneous labor. Under this regimen of management there were three stillbirths including the one antepartum death, no neonatal mortality, no maternal mortality, one case of postpartum hemorrhage and a 4 per cent maternal morbidity rate including one day febrility.

From an evaluation of the current series and from the results in the literature relative to the effects of postdate labor on the mother and the fetus we conclude that these cases should be managed no differently than pregnancies of normal duration.

Summary and Conclusions

1. The suggestion has been made that the term postmaturity be replaced by the term "postdate labor," since the latter has fewer pathologic connotations.

2. In a series of 4,673 consecutive deliveries, the incidence of postdate labor was 2.6 per cent (123 cases).

3. The incidence of babies that weighed 9 pounds or more is 8.1 per cent. This is no greater than the expectancy in this weight group. Thus gestational age appears to have no direct influence on the production of oversize babies.

4. There were no congenital anomalies and but one antepartum intrauterine fetal death encountered in the current series.

5. A fetal mortality of 2.4 per cent, no neonatal mortality, no maternal deaths, and a maternal morbidity of 4.0 per cent are reported.

6. The indicated midforceps incidence of 8.9 per cent is high, but is related to obstetric indications and not to postdate labor.

7. The cesarean section rate of 5.7 per cent is the same as the clinic average.

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140 Eighth Avenue
47 Plaza Street

PERFORATING HYDATIDIFORM MOLE*

DAVID KUPERSTEIN, M.D., F.A.C.S., AND ABRAHAM MACKLES, M.D.,
BROOKLYN, N. Y.

(From the Jewish Hospital of Brooklyn)

THE penetrative type of mole is relatively uncommon, but the perforating type is rare.

Hydatidiform mole was first described by Aetius of Amida, who was court physician to Justinian I in the sixth century. The true nature of this affection was first recognized by Velpeau and Madama Boivin in 1827, and since then it has been accepted as a disease of the chorion.[1] In 1859, Marchand demonstrated that the essential feature was a profuse and irregular proliferation, with penetrative powers, of both the syncytium and the Langhans layers of cells.

The incidence of mole in this country is one in approximately 2,000 deliveries. Acosta-Sison[2] gives us the amazing incidence of one in 145 pregnancies among Filipinos.

Chorioadenoma destruens, as designated by Ewing[3] in 1910, was originally believed to be a malignant type of mole. In 1930, Novak[4] felt that chorioadenoma destruens belonged in the choriomalignum group but was of a lower grade of malignancy than some other types. It is generally agreed at this date that this entity is benign. This designation, according to Hertig and Sheldon,[5] is used for the group of chorionic "malignancies" which are characterized pathologically by persistent invasion of the myometrium by low-grade malignant trophoblast usually still attached to its parent villus. These tumors rarely, if ever, give rise to clinical evidence of metastasis, and, therefore, the prognosis is excellent, provided the uterus is removed. A very important finding regardless of the amount of trophoblastic overgrowth is the presence of well-formed chorionic villi deep within the uterine musculature. This indicates a benign course. Microscopically, sheets or masses of anaplastic, undifferentiated trophoblastic cells are found deep within the myometrium associated with marked necrosis and destruction of muscle with resulting hemorrhage. Chorioadenoma destruens has been referred to as invasive, penetrative, and destructive mole.

Clinically, this group is characterized by various amounts of uterine subinvolution, postmolar vaginal bleeding, and usually a persistent positive test for chorionic gonadotropic hormone. Multiple lutein cysts are found in association with hydatidiform mole, are usually bilateral, and may assume huge

*Presented at a meeting of the Brooklyn Gynecological Society, Oct. 21, 1953.

proportions. Novak[6] feels that these lutein cysts represent a pathologic physiologic response of granulosal or thecal cells to the excessive gonadotropic hormones produced by the excessive trophoblast.

Sheldon and Hertig[5] reported 32 cases of chorioadenoma destruens in 200 cases of hydatidiform mole with one perforation which occurred forty days after the passage of the mole. Hunt, Dockerty, and Randall[7] reported 11 cases of chorioadenoma destruens in 41 cases of hydatidiform mole without any perforation. Gaum[8] reported 3 cases of chorioadenoma destruens without any perforation. Chorioadenoma destruens does not cause death because of malignancy, but may cause death by perforation, sepsis, or hemorrhage.

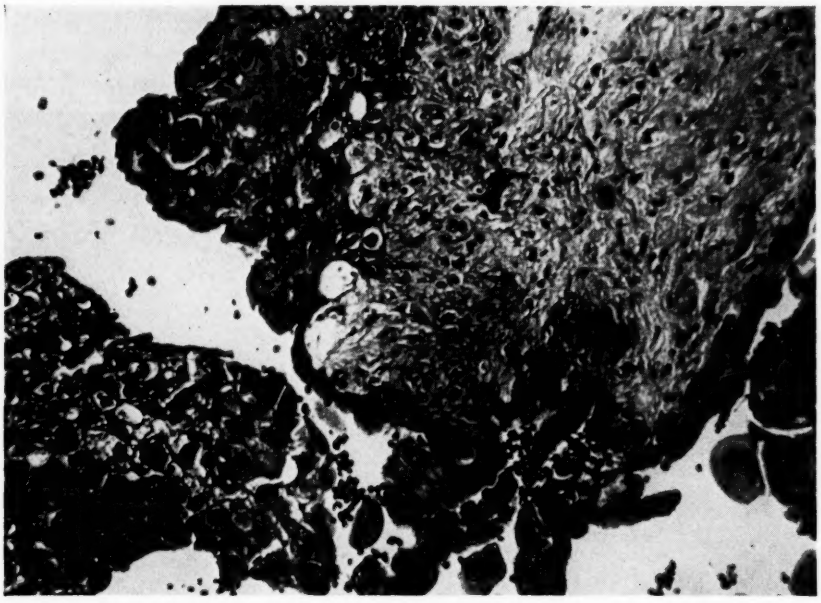

Fig. 1.—Section from hydatidiform mole showing moderate degree of trophoblastic proliferation and only slight anaplasia.

Case Report

H. B., a 21-year-old white woman, gravida i, para 0, had her last menstrual period on Dec. 19, 1950. Menarche was at the age of 13 and thereafter periods occurred every twenty-seven days and were of seven days' duration.

On Feb. 5, 1951, there was a short period of vaginal spotting. On March 8, 1951, profuse vaginal bleeding occurred and the patient was admitted to the hospital. Examination revealed a uterus palpable 2 cm. above the umbilicus, firm, regular, the size of a twenty-four weeks' gestation, fetal heartbeat and movements absent, and profuse vaginal bleeding still present. The pulse was rapid with a rate of 140 per minute and of fair quality. The blood pressure was 150/70. Hemoglobin was 8 Gm., red cell count 3.21 million, and white cell count 13,050. The blood was Rh positive and Group A. Urinalysis showed a trace of albumin and a few hyaline casts. The Aschheim-Zondek test was *negative.*

A diagnosis of hydatidiform mole was made and about two hours later an abdominal hysterotomy was performed. The uterus was tense and purplish in color while the tubes and ovaries appeared normal. On incision of the uterus, a large amount of purplish blood

spurted forth with a tremendous mass of grapelike structures. The uterine cavity was finger curetted until there was no tissue remaining and the endometrium was closely examined. Routine closure was done. A transfusion of 1,000 c.c. of whole blood was given during the operative procedure.

The pathologic description of the curettings (March 9, 1951) was: The specimen consisted of about 400 c.c. of material composed of innumerable translucent gray and white grapelike vesicles measuring up to 0.5 cm. in diameter. Microscopic examination showed that many villi were markedly enlarged (Fig. 1). The interior consisted only of eosinophilic afibrillar material with no blood vessels. Trophoblastic proliferation was present to a moderate degree, but the nuclei of the Langhans cells showed little or no anaplasia and the syncytial cell nuclei, while showing some variation in size, also displayed no anaplasia. The diagnosis was hydatidiform mole with moderate trophoblastic proliferation.

The postoperative course was uneventful with the wound healing per primam. The patient was discharged on March 18, 1951, nine days following admission.

Fig. 2.

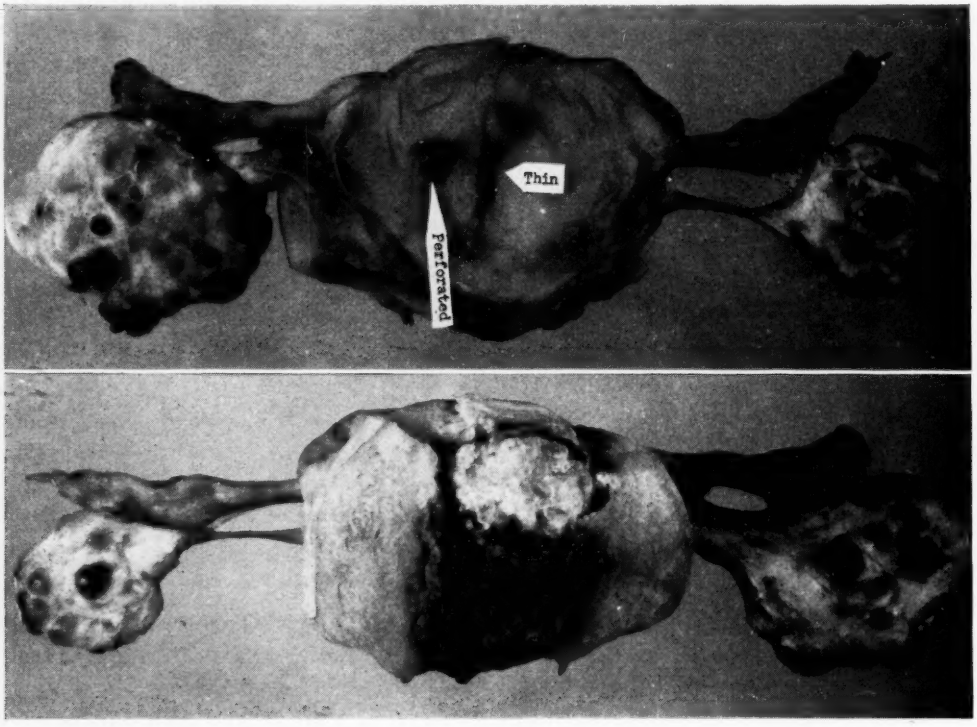

Fig. 3.

Fig. 2.—Anterior surface of uterus showing hysterotomy scar (marked "thin") and site of perforation. Ovaries are enlarged and polycystic.

Fig. 3.—Uterus opened along posterior surface. Upper part of cavity occupied by mole and lower part of blood clot.

About four weeks after discharge from the hospital, there was vaginal bleeding for one day. Five weeks after discharge the pelvic examination revealed the uterus to be slightly enlarged and there were palpable bilateral enlarged ovaries. Eight weeks following hysterotomy, the Aschheim-Zondek test for the first time was positive in dilution 1:100.

Sixty-nine days after the hysterotomy, the patient experienced sudden severe lower abdominal pain accompanied by nausea and profuse vaginal bleeding. On her readmission

to the hospital, examination revealed the lower half of the abdomen to be distended and tender, tympanitic throughout, but with no fluid wave. Sedation and 1,000 c.c. of whole blood were given but within four hours, her condition became critical. The blood pressure fell from 115/80 to 80/50; the hemoglobin was 8.57 Gm.; hematocrit 27.5 per cent. The abdomen had become more distended, with dullness in the flanks and was markedly tender. A diagnosis of perforation of the uterus was made and immediate laparotomy performed.

On opening the abdomen, about 500 c.c. of free blood was found in the peritoneal cavity mixed with a large amount of hydatidiform vesicles. The uterus was enlarged to the size of an eight weeks' gestation. The hysterotomy scar was thin but well healed. On the anterior surface of the uterus near the left cornual area, was a perforation with molar tissue extruding through the opening. Both ovaries were enlarged and polycystic with molar tissue present on the surface of the right ovary (Fig. 2).

Under cyclopropane anesthesia, a total hysterectomy and bilateral salpingo-oophorectomy were performed. A transfusion of 2,000 c.c. of whole blood was given intra-arterially.

The pathologic description of the uterus, tubes, and ovaries, May 18, 1951, was:

Gross: The specimen consisted of a complete uterus with attached Fallopian tubes and ovaries.

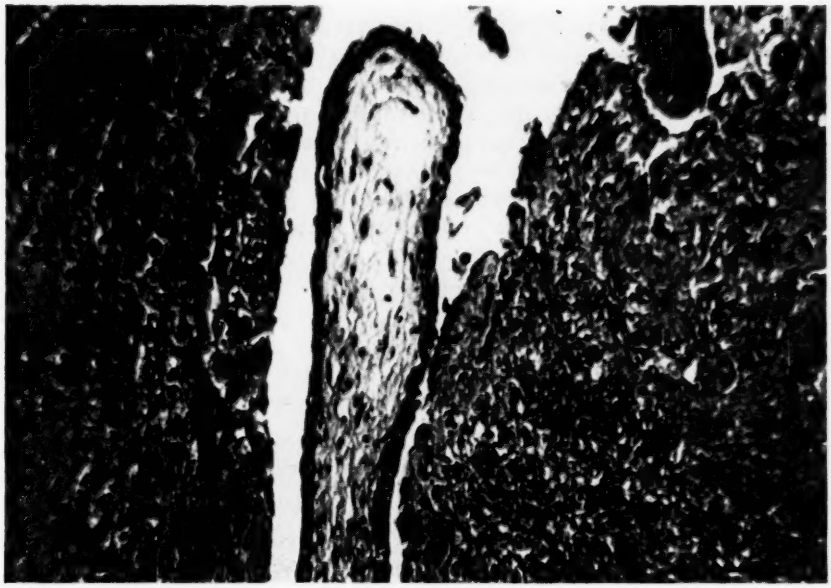

Fig. 4.—Details of a chorionic villus within the wall. Surrounding tissue is necrotic.

The uterus was 7.5 cm. long, 9 cm. wide, and 4 cm. thick. In the center of the anterior wall the organ was considerably thinned and the overlying serosa puckered though intact. This was the hysterotomy scar. A soft, slightly elevated red area was seen on the anterior wall near the left cornu. Here the serosa was ragged. A probe could be inserted into this area and be made to extend into the myometrium but not into the endometrial canal. The upper third of the endometrial canal was filled with small grapelike yellow-gray vesicles.

The left ovary measured 4.5 by 3 by 1 cm. and the right 8 by 5 by 2 cm. Each contained many cysts up to 2.5 cm. in diameter; some cysts were filled with clear fluid and in others the fluid was blood stained (Fig. 3).

Multiple sections through the myometrium revealed the following: (a) a soft, irregular, hemorrhagic area 1 cm. in diameter in the mid-portion of the posterior wall; (b)

an area 2.5 cm. wide in the fundus which was contiguous with and composed of molar tissue which extended into the myometrium; (c) a tract within the anterior wall 2 cm. long terminating on the serous surface in the perforation previously noted.

Microscopic: The right ovary contained many cysts lined by granulosa-lutein cells. Organizing blood clot containing several structures that resembled villi but were ghostlike and acellular was present. In attached fatty tissue, sheets of well-preserved decidual cells and a dense lymphocytic infiltrate were noted. The left ovary contained cysts similar to those seen in the right, and, at the periphery, several nests of decidual cells.

In preparations from the uterus the myometrium contained broad areas of necrosis in which the tissues stained poorly and the nuclei were pyknotic. In several of these areas, nests composed of Langhans' cells and syncytial giant cells were noted. The nuclei appeared rather uniform in these nests. No villous structures were noted here. In other areas and deep within the myometrium definite elongated villi lined by intact epithelium were seen. Section through the perforation showed extensive hemorrhage and only a few trophoblastic cells. Section from the upper part of the uterus showed infiltration of the superficial myometruim by large syncytial cells, the picture being reminiscent of so-called "syncytial endometritis." Where the endometrium was intact it consisted of decidual tissue (Fig. 4).

Diagnosis: Uterus with invasive and perforating hydatidiform mole and with decidual reaction. Ovaries with multiple lutein cysts and decidual reaction. Blood clot from peritoneal cavity and vagina with hydatidiform mole.

The first four postoperative days were stormy, but then the convalescence was uneventful and the patient was discharged from the hospital on the twelfth day. The Aschheim-Zondek test did not become negative until four and one-half months following the second operation and has remained negative. Repeated radiographs of the chest have been negative for metastasis. The patient has been seen frequently and the last examination was made on Sept. 23, 1953, more than two years since her laparotomy. Abdominal and pelvic examination has revealed no abnormality and she has been asymptomatic.

Conclusions

1. Chorioadenoma destruens is benign.
2. It is characterized pathologically by persistent invasion of the myometrium by low-grade malignant trophoblast usually still attached to its parent villus.
3. The presence of well-formed chorionic villi deep within the uterine musculature indicates a benign course.
4. These tumors, rarely, if ever, give rise to metastasis, and, therefore, the prognosis is excellent, provided the uterus is removed.
5. Death occurs because of perforation, sepsis, or hemorrhage and not because of malignancy.
6. The penetrative mole is relatively uncommon, but the perforating type is rare.
7. In this case, chorioadenoma destruens perforated the uterus sixty-nine days following the original laparotomy for hydatidiform mole.

Summary

A case of invasive mole which perforated the uterus is presented; molar tissue was found free in the peritoneal cavity; the patient is alive and asymptomatic twenty-eight months after hysterectomy.

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920 Montgomery Street

d-AMPHETAMINE SULFATE IN THE TREATMENT OF PREPARTUM NAUSEA AND VOMITING

A Two-Year Study of 150 Unwed Mothers

WILLIAM CALDWELL, M.D., LOS ANGELES, CALIF.

(From St. Anne's Maternity Hospital)

THE distressing symptoms of nausea and vomiting occur in about 50 per cent of all pregnancies.[1, 2] Although these symptoms usually first occur in the fifth or sixth week, it is not at all uncommon for them to occur at any time during gestation. So many women experience moderate to severe nausea and vomiting throughout most or all of the gestation period that the treatment of this syndrome is a pressing medical problem. Clearly, any condition that involves half of all pregnancies deserves serious consideration and study.

The etiology of prepartum nausea and vomiting is unknown. A great many studies have attempted to establish physiological bases for the syndrome, but as yet there has been no convincing proof of their validity. The major organic theories ascribe prepartum nausea and vomiting to (a) allergic reactions,[3] (b) endocrine disturbances,[4] and (c) nutritional deficiencies.[5]

Many investigators—there is a lengthy bibliography in Dunbar[6]—have suggested that emotional factors may be the underlying cause of these annoying and perplexing symptoms, and there are several excellent reasons supporting this belief. Prepartum nausea and vomiting are more common among "high strung" women[7]; they are very uncommon in Oriental countries (except in industrialized Japan) and among Eskimos and African natives[8]; animals show no signs of vomiting during pregnancy.[9] In many experiments which treat the condition as a purely organic entity, placebos have been found to be as effective as the active drug,[10] and psychotherapeutic techniques have been singularly successful in its treatment.[11]

Whatever the basic cause of prepartum nausea and vomiting, there is no doubt, even among strong supporters of an organic etiology,[1] that it is usually accompanied by emotional stress. The present study was conducted to see if a comparatively superficial treatment of emotional symptoms would be successful in alleviating physical distress.

Method

This study was conducted over a two-year period on 150 pregnant women who suffered from nausea and vomiting. All were outpatients at St. Anne's Maternity Hospital in Los Angeles, a charitable institution devoted to providing medical care for unwed mothers. The patients, all of whom were to give birth to illegitimate children, evidenced, understandably enough, a high degree of tension, anxiety, and depression.

The treatment consisted merely of repeated assurances that the symptoms would be alleviated by medication, followed by the administration of small

doses of d-amphetamine sulfate.* This drug, a well-established antidepressant, was chosen partly because of its mood-elevating effect and partly because it has been proved harmless when used during pregnancy.[12]

The dose was adjusted to the individual. At the first complaint of nausea and vomiting each patient was given 2.5 mg. of d-amphetamine sulfate twice a day. If necessary, the dose was increased to 5 mg. twice a day. Some patients required 5 mg. three times a day to achieve satisfactory results. The patients were instructed to take the first dose at least thirty minutes before breakfast, and not to take the last dose later than 4 P.M. After four symptom-free weeks the dose was gradually decreased. If there were no apparent results after three weeks, the medication was withdrawn.

Results

The results of this uncomplicated treatment were surprisingly good. Of the 150 patients treated 52 (about 35 per cent) achieved an excellent response. In three to five days after the medication was administered (2.5 mg. twice a day) they experienced complete relief from their symptoms.

Good results were obtained in 53 patients (again, about 35 per cent). Their symptoms were partially alleviated in the first week of treatment, and completely alleviated during the third or fourth week. The complete alleviation of symptoms usually occurred when the dose was increased. The average effective dose was 5 mg. twice a day.

Fair results were obtained in 29 patients (19 per cent) who showed a variable response to the medication. At times they would enjoy an almost complete relief and at other times partial relief from their symptoms. The amount of vomiting decreased significantly in all these patients, but a slight feeling of nausea frequently persisted. The average dose was 5 mg. three times a day.

Sixteen patients (11 per cent) received no significant benefit from the medication. There were no serious side effects observed. Although 25 patients complained of slight nervousness and insomnia, a lowering of the dose resulted in the complete disappearance of these symptoms in all but 3 patients. In no case were the side effects severe enough to cause discontinuance of the medication. The drug had no adverse effect on the fetus or the mother; the babies were all normal in every respect.

Comment

Although unfaithfulness to the regimen was considered partly responsible for the variable results experienced by 29 patients, it was noted that some of them—and almost all of the 16 who failed to achieve any response—seemed subject to a greater than average amount of emotional stress. Obviously, a combination of superficial psychotherapy and drug medication cannot successfully treat patients with the more deep-seated emotional problems.

The good to excellent response of the great majority of patients can be attributed to the mood-elevating action of the medication. In all these patients the alleviation of nausea and vomiting coincided with increased energy and heightened optimism. An understanding, confident attitude on the part of the physician undoubtedly facilitates the beneficial results obtained by the drug.

*Dexedrine, Smith, Kline & French Laboratories.

It is probable that some of these patients experienced a placebo response; it seems inconceivable, however, that a placebo effect can explain the results obtained in all of them. A good number of them (25 per cent) had not responded to antihistamine or other therapy, and no previous treatment of many hundreds of patients had ever resulted in such a significant percentage of good to excellent results. This is not to suggest that d-amphetamine sulfate is the only effective treatment for the nausea and vomiting of pregnancy. It does, though, seem to be the best treatment for those patients whose nausea and vomiting is accompanied, and possibly caused or aggravated, by anxiety and depression. In excessively agitated patients I have found the use of barbiturates helpful. Then, too, it does not seem advisable to prescribe amphetamine therapy alone for patients who are suffering from a deep-seated neurosis. Before beginning any treatment the physician should, of course, first determine whether or not an organic pathological condition exists.

It might be well to point out that the transient psychic unrest which causes or complicates the nausea and vomiting of pregnancy does not indicate that women who experience these symptoms are more "neurotic" than their more fortunate sisters. An excellent study by Bernstein[13] demonstrates that all women react in pretty much the same way to pregnancy, but many, because of a higher vomiting threshold or because they express emotional unrest in other ways, are spared the physical distress of nausea and vomiting. It should also be noted, however, that the reactions of these unwed patients to pregnancy, although not differing in kind from those of most married women, do, because of the patient's added burden of self and social recrimination, differ in degree. In general, their psychic unrest is intensified by environmental stress. The experiment, then, was considered a more than ordinarily difficult test for the medication.

Summary and Conclusions

After a brief review of the etiological theories which attempt to explain the nausea and vomiting of pregnancy, a report is made on a two-year study of d-amphetamine sulfate (Dexedrine) in the treatment of 150 unmarried women suffering from these symptoms.

The drug achieved good-to-excellent results in 105 patients (70 per cent); fair results in 29 (19 per cent). Sixteen patients (11 per cent) were not benefited by the treatment.

It was concluded that Dexedrine is highly effective in the treatment of prepartum nausea and vomiting, and suggested that these results might give added support to the theory that the syndrome is psychic in origin.

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RELATION OF TORTICOLLIS TO BREECH DELIVERY

F. J. Roemer, M.D., Bedford, Ohio

(From the Departments of Obstetrics and Gynecology of Doctors Hospital and Marymount Hospital and the Records Department of Lakeside Hospital)

THE possibility of injury to the sternocleidomastoid muscle during breech delivery has been mentioned in both old and new obstetrical treatises. I have not encountered anywhere in the literature, however, the concept that the process of breech delivery causes torticollis. The possibility of this relationship occurred to me when I noticed several cases of torticollis which appeared in my own private practice. The only common feature in the histories of these patients was that they had all been born by breech presentation.*

Method

Charts of 106 cases of torticollis operated on by the Department of Orthopedics at Lakeside Hospital during the past 25 years were studied.† Through the history notes, letters to parents and to the hospitals where the patients had been born, and telephone calls and house calls to patients or their parents, it was possible to trace back the pertinent obstetrical data in 44 out of these 106 cases. Table I lists the essential findings.

Findings

The outstanding fact was that 27 of the 44 cases studied had been delivered by breech, footling, or podalic version. Thus 60 per cent, or practically two-thirds of unselected cases of persons with torticollis, were found to have been born headlast instead of headfirst. Since the usual incidence of breech delivery throughout the general population is in the neighborhood of 5 per cent, a strong causal relationship was immediately apparent.

No cases of bilateral torticollis deformity were found. Of the 17 patients not born by breech delivery, 5 had unknown obstetrical histories (included in this study because of other interesting findings). Two were born by cesarean section, 7 were rotated by forceps manipulation, 1 was an arm presentation (method of delivery unknown), and only 2 were left occipitoanterior low forceps (one of these was from a pre-eclamptic mother, the other baby showed "bruises on the head from forceps"). One notes that there were no completely normal spontaneous or forceps deliveries in the entire series. One also notes that the second largest group of deliveries (7) were those that had been rotated by the attendant with forceps from the transverse or posterior position to occiput anterior. This suggests that the Scanzoni and like procedures are not as innocuous as many of us have regarded them.

*The original idea was enhanced by a conversation with an active orthopedist, Dr. Wallace S. Duncan, who also recalled that a large proportion of his patients with torticollis had been born by breech delivery.

†These charts were made available through the kind cooperation of Dr. Gilbert J. Vosburgh, Professor of Obstetrics at Western Reserve University.

Comment

It is my opinion that the actual injury which ultimately results in torticollis deformity occurs when the already-delivered legs and trunk of the fetus are raised ceilingward in order to rotate the face out of the pelvis into the introitus or in order to apply the forceps to the aftercoming head. It is also quite possible however, that the injury to the sternocleidomastoideus is sustained before the head is in the pelvis. Extreme laterohyperextension sufficient to rupture the sternocleidomastoid might occur as the head passes over the sacral promontory. Furthermore, Wilcox[1] and, more recently, Dougherty, Mickey, and Moore[2] have shown that the fetal head sometimes (10 per cent of cases) rests in utero in various degrees of hyperextension. One can readily imagine that the sternocleidomastoid may be ruptured when the uterine fundus contracts forcibly on a fetus in this attitude.

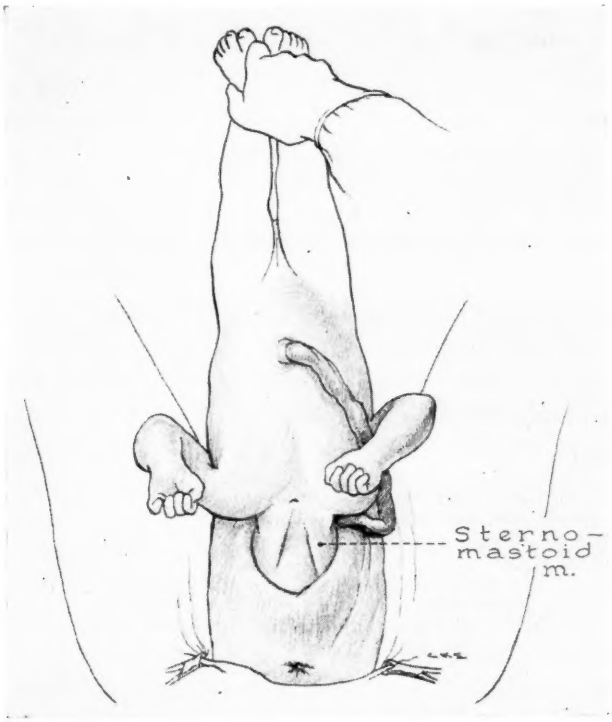

Fig. 1.—Stage during breech delivery when upward force exerted by operator might injure the sternocleidomastoid muscle, especially if there is lateral deviation of the fetal head or trunk.

When dealing with the aftercoming head one would think that by placing the finger in the baby's mouth and applying suprapubic pressure to aid in upward rotation of the face one would effectively reduce the strain on the sternocleidomastoid muscles. With the possibility of this type of injury firmly in mind during the delivery, however, I have recently had two breech-delivered babies develop lumps in the sternocleidomastoid areas. These are probably hematomas which represent failure in prevention of the injury.

TABLE I. DATA FROM 44 CASES OF WRYNECK OPERATED ON FROM 1932 TO 1952

PATIENT	OBSTETRICAL AND OTHER PERTINENT DATA	AGE LUMP APPEARED	AGE WRY-NECK NOTED	AGE AT OPERATION
B. L. S.	Footling			6 years
V. P.	Unknown	3 weeks	"Infancy"	9 months
S. C.	Breech, 7 months premature	At birth	6 years	7 years
G. I. P.	R.O.T., midforceps		2 months	3 months
B. B. A.	Footling extraction with fractured humerus		3 weeks	3 months
E. S.	R.O.P., podalic version; bruise beneath right mastoid noted immediately after after delivery	10 days	8 years	11 years
J. T.	Podalic version		3 weeks	3 months
D. A. P.	Low classical section, head well engaged		"Infancy"	7 months
J. L. P.	Low forceps, "head bruised at birth"		"Infancy"	7 months
L. J. B.	Breech extraction	At birth		4 years
B. M. D.	Breech		Birth	4 months
J. A. K.	Breech		"Infancy"	3½ years
B. O.	Arm presentation, developed Erb's Palsy, weighed 10 pounds at birth, difficult forceps delivery			
R. L. E.	Scanzoni, facial paralysis noted at delivery		Birth	6 weeks
J. K.	Breech		1 month	4 months
C. R. C.	Breech; baby also had contractures of left hip musculature	"cord" noted First Week		4 years
F. K.	Breech		"Infancy"	6 years
J. McC.	Breech; also developed scoliosis		3 years	5 years
C. A. R.	Scanzoni		4 years	16 years
P. B.	Easy spontaneous delivery; had "congenital spinal sclerosis" requiring several tenotomies including one of the sterno-cleidomastoid			
R. H.	Wryneck appeared soon after auto accident in which head was injured and patient was unconscious for one-half hour	None	18 years	21 years
J. K.	Breech		6 years	6 years
K. G.	Low forceps, L.O.A., pre-eclampsia		1 year	4 years
L. A. J.	Scanzoni			14 months
R. A. Jr.	Scanzoni		"Early"	7 weeks
E. M. L.	Unknown	1 month		11 months
R. W.	Breech		3 months	5 years
A. S.	Breech extraction		3 months	1 year
M. K.	Breech with much traction			6 years
G. M. Jr.	Breech; also had dislocated left hip			2 months

TABLE I. CONT'D.

PATIENT	OBSTETRICAL AND OTHER PERTINENT DATA	AGE LUMP APPEARED	AGE WRY-NECK NOTED	AGE AT OPERATION
D. J.	Breech		"Infancy"	
A. N.	Breech		"Infancy"	
A. M.	Unknown, unoperated upon for mastoiditis in infancy			9 years
M. C.	Breech	At birth		11 months
A. B.	Breech		7 years	9 years
G. H.	"Baby was turned," forceps marks on forehead	First week	1½ years	7½ years
F. E. B. Jr.	Difficult breech	3 weeks	3 weeks	7 weeks
A. B.	Cesarean section at 7½ months, also had ipsilateral equinovarus			
B. S.	Breech			3 years
A. C.	Breech		1 year	8 years
F. W.	Unknown	First month		11 years
M. S.	Breech			4 years
B. C.	Breech	3 weeks	10 months	
B. G. T.	Breech, premature, eighth month			

Whether every infant who shows a tumor in the region of the sternocleidomastoid muscle soon after breech delivery will eventually have torticollis deformity cannot yet be definitely determined. That ten of the cases studied did present such a lump in early infancy seems strongly suggestive. This proportion of cases exhibiting a "lump" is compatible with the proposition that almost all of the patients have had such a lump. This last statement is based on the fact that in the collection of data this information about a "lump on the baby's neck" would not be voluntarily asked for by the intern or medical student taking a routine history since it is not a well-known medical entity and is alluded to only once in medical literature[3] to my knowledge. Also, curiously, mothers are not prone to notice these neck anomalies. Frequently the orthopedic histories revealed that the torticollis was first noticed by neighbors or friends and that the mother had to be more or less persuaded that the deformity existed. Undoubtedly the actual deformity of torticollis is insidious in its appearance and is the result of gradual cicatricial contraction in or about the sternocleidomastoid muscle. This in turn is due to a tear of the muscle or possibly of its fascial sheath or nerve or blood supply leading to hematoma formation (that the lump is a hematoma is suggested by descriptions given by two mothers in which they emphasized the blue color of the tumors). As the neck lengthens in the process of normal growth the child's head gradually turns to one side since the damaged muscle is less elastic and does not elongate at the same rate as its normal contralateral fellow.

Stone[3] has suggested that the torticollis is already present in utero before labor starts and considers this a cause, rather than a result, of breech presentation. The following points argue against the validity of this idea:

A. Torticollis causes asymmetric development of the face, head, and cervical vetrebra. Were the condition present in utero, then these changes should be present at the time of delivery. Except in Case 14, where unilateral facial paralysis was noticed at the time of delivery, no cases of asymmetry were found.

B. In all but this single case, torticollis was not found for months or years after delivery. Surely all of the allegedly foreshortened muscles would not be torn at delivery, especially those of infants delivered by cesarean section. One of the babies delivered by cesarean section was in vertex presentation and the muscle was probably injured in disengaging the head from the pelvis. The other was a 7½ month premature infant, details of position and the cause for operation not being known.

C. The mechanism of how torticollis in utero could cause breech presentation is not easily explained. Asynclitism appears to be a more likely result of such a mechanical deviation of the head.

D. Case 14, the only one with torticollis at time of birth, was in vertex presentation.

Other causes of torticollis than birth injury to the sternocleidomastoid were apparent in Case 21 in which the deformity appeared after an automobile accident at the age of 18 years and in Case 20 in which the diagnosis was "congenital spinal scoliosis" and the patient had multiple tenotomies including one of the sternocleidomastoid.

From this study it seems quite safe to assume that what we have usually referred to in the past as "spastic torticollis," "caput obstipum," "congenital torticollis," or "congenital wryneck" is in reality a birth injury, possibly preventable.

Conclusions

1. Torticollis (wryneck) is usually a result of birth injury associated with breech delivery (two-thirds of the cases studied) or associated with forceps rotation from the occiput transverse or occiput posterior to the occiput anterior (one-sixth of the cases studied).

2. A visible or palpable tumor appearing in the region of the sternocleidomastoid muscle within a few days after the delivery of a baby born by breech presentation indicates that this muscle mechanism has been damaged and that after a period of months or years, torticollis deformity will probably appear.

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RHEUMATIC HEART DISEASE IN PREGNANCY: THE REMOTE PROGNOSIS IN PATIENTS WITH "FUNCTIONALLY SEVERE" DISEASE

HAROLD GORENBERG, M.D., JERSEY CITY, N. J., AND LEON C. CHESLEY, PH.D.,*
BROOKLYN, N. Y.

(From the Margaret Hague Maternity Hospital)

IN THE Margaret Hague Maternity Hospital, as in several other leading obstetric clinics of the northeastern United States, rheumatic heart disease is the leading cause of maternal death. This situation can be remedied, for adequate prenatal care prevents congestive heart failure, the most common cause of death in pregnant cardiac patients.

The principles of the management of the cardiac patient in pregnancy have been fully developed elsewhere.[5, 6] Under this regime more than 550 women with rheumatic heart disease have been carried through pregnancy, by our Cardiac Clinic, with but 2 deaths. Fitzgerald and associates,[2] of the Cook County Hospital, have reported that only 3 of their 460 Cardiac Clinic Patients died in pregnancy or the puerperium. All 3 deaths occurred after hysterotomy at two months, ten weeks, and four months, respectively. The conclusion appears to be that if a patient with rheumatic heart disease is seen early enough in pregnancy to be "benefited" by a therapeutic abortion, she has been seen early enough to receive good medical care and thus be allowed to complete a successful pregnancy. In our hospital, as in Cook County, the deaths from heart disease occur overwhelmingly in patients not seen in the Cardiac Clinic. There is reason to suppose that most of these deaths are preventable.

In a previous paper,[6] we showed that the annual death rate in pregnancy, for properly managed Cardiac Clinic patients, is only one-sixth that for all female rheumatic cardiac patients in the childbearing age. In that publication we reported also that the remote prognosis was unaffected by repeated pregnancies. In an average follow-up period of ten years, with all but 3 patients traced, pregnancies subsequent to the initial one observed in our five-year base period of 1937-1942 had not increased the annual death rate. It appears that there is no evidence to support the contention that the life of a pregnant cardiac patient would be prolonged by a therapeutic abortion.

That series comprised 260 women with rheumatic heart disease of varying degrees of severity. Only 34, however, had cardiac impairment severe enough to warrant a functional grading of Class III or IV prior to pregnancy. Realizing that our over-all results could be criticized as being weighted with patients

*Present address: Department of Obstetrics and Gynecology, State University of New York College of Medicine at New York City.

who had relatively mild heart disease (Classes I and II), we have studied a large series of patients with severe heart disease delivered in our hospital, to test the conclusion that pregnancy does not affect adversely the remote prognosis. Thus this report is an analysis of the remote prognosis of pregnant women who had "functionally severe" rheumatic heart disease.

Material

We have reviewed every chart bearing the diagnosis of rheumatic heart disease, covering the period from the opening of the hospital in October, 1931, through 1943. Every patient was accepted as having severe heart disease if she satisfied any one of the following criteria:

1. History of cardiac failure, excluding failure during an acute phase of rheumatic carditis (46 cases; 8 on this criterion alone).
2. Class III or IV at the time of conception (57 cases; 11 on this criterion alone).
3. Auricular fibrillation (15 cases; only one on this criterion alone).
4. Cardiac failure in pregnancy (104 cases; 55 on this criterion alone).

By these criteria, we had 137 patients with severe heart disease who were discharged from the hospital. Seventy-five of the patients followed up satisfied one of the criteria, 33 satisfied two, 19 satisfied three, and 6 satisfied all four. The incidence of severe heart disease, in the 68,724 deliveries which occurred during these years, was 0.18 per cent. The severe cases constituted 18 per cent of all cases of rheumatic heart disease. Omitting the Class I patients who had heart failure during pregnancy, the series represents 14 per cent of all rheumatic cardiac patients seen during this base period of 12.2 years. This proportion of severe cardiac disease (14 per cent) is very close to the 12 per cent reported by Hamilton as "unfavorable" cases seen at the Boston Lying-in Hospital, suggesting that our series is not abnormally seeded.

We have used the Classification of the American Heart Association and all analyses are based upon the Class prior to pregnancy.

Results

All but one of the 137 patients have been traced to 1952 and all but one of the known survivors have been re-examined. We have studied the charts, in many hospitals, of those patients who have been hospitalized and have obtained information from several physicians who have attended these patients. The average length of follow-up is almost exactly ten years and ranges up to twenty-one years; all patients still living have been followed at least eight and one-half years.

Three of the patients, with diagnoses of rheumatic heart disease with decompensation in pregnancy, were found to have no clinical or x-ray evidence of organic heart disease at follow-up. One of these was sectioned and sterilized, in 1931, on the indication of severe rheumatic heart disease. The untraced patient was a Class I cardiac with heart failure in the eighth month of gestation, in 1935. Some months later a cardiologist again considered her to be in Class I. The three patients with no detectable heart disease at follow-up and the one untraced patient will be excluded from all of the analyses and tables. We are thus left with 133 patients for study.

All analyses of our data indicate to us that pregnancy does not have any adverse effect upon the remote prognosis of these "severe" cardiac patients.

The ideal set of statistics to prove this point would be a comparison of a group of aborted patients or nulliparous patients with a group of nonaborted

parous patients. Since we have no group of aborted or nulliparous women to use as a control, our conclusion that pregnancy does not shorten the average life expectancy of patients with rheumatic heart disease is based upon the establishment of an "internal control" group. If a pregnancy is considered to exert a harmful influence on longevity in patients with rheumatic heart disease then more pregnancies should shorten a cardiac patient's life even further. A number of our "severe" cases have assumed the risk of subsequent pregnancies and statistical analysis should show their lives to have been shortened, if in fact such an influence exists. As in our previous report,[6] we have compared two groups of patients: those with and those without a pregnancy subsequent to the one which qualified them for inclusion in this "severe" series.

Table I shows that the annual death rates are not increased by subsequent pregnancies. In fact, the death rates are lower in those patients who assumed the risk of a later pregnancy despite the hazards of the pregnancies themselves. Those who have had later pregnancies obviously have lived long enough to do so and it might be argued that this is the only significance of these figures. This objection, however, is answered by excluding the first five years of follow-up. The death rate still is lower in the patients who had a subsequent pregnancy, 63.5 per thousand per year as compared to 83.4 per thousand per year in the patients who had no future conception. Certainly the exclusion of the first five years of follow-up allows time for the more seriously sick patients to die and for the less seriously sick patients to conceive again. Actually, it does not matter how many of the first years of follow-up are excluded, for at any level of exclusion the annual death rates are not increased by later pregnancies.

TABLE I. ANNUAL DEATH RATES IN PATIENTS WITH SEVERE HEART DISEASE IN RELATION TO LENGTH OF FOLLOW-UP AND LATER PREGNANCIES: CLASS I PATIENTS EXCLUDED

LENGTH OF FOLLOW-UP	NO LATER PREGNANCY			LATER PREGNANCY			TOTALS		
	PATIENT-YEARS	DEATHS	A D R*	PATIENT-YEARS	DEATHS	A D R*	PATIENT-YEARS	DEATHS	A D R*
First 5 years	298.0	25	83.9	132.0	6	45.4	430.0	31	72.2
Second 5 years	199.5	14	70.2	88.0	7	79.6	287.5	21	73.1
Third 5 years	96.5	11	114.0	53.5	3	56.1	150.0	14	93.4
Fourth 5 years	16.0	1	62.6	16.0	0	0	32.0	1	31.3
Total	610.0	51	83.6	289.5	16	55.3	899.5	67	74.7
Total, excluding first 5 years	312.0	26	83.4	157.5	10	63.5	469.5	36	76.7
CLASS I.—									
Total, excluding first 5 years	169.5	7	41.3	82.0	3	36.6	251.5	10	39.8

*Annual death rate per thousand.

Several previous attempts to determine the effect of pregnancy on longevity in patients with rheumatic heart disease have been made by comparing groups of nulliparas to groups of parous women.[1, 3, 4] This form of analysis was deemed unsatisfactory by critics who argued that the nonpregnant group would be overweighted with a more severe type of heart disease, with women who would be too incapacitated in early years to risk assuming marriage or the risk of pregnancy, while the pregnant group would tend to include the majority of patients with relatively mild heart disease, the functionally more competent cardiac patients. The method employed by Boyer and Nadas,[1] who attempted to answer this criticism, seems to have received short shrift.

Our method of "internal control" described above could be subjected to the same critical argument. It might be said that only the patient with milder

cardiac disease goes on to have more children. Thus the question arises as to the distribution of these later pregnancies. Do they occur predominantly among the patients with less severe cardiac impairment? Table II answers this question in the negative. The 34 Class I patients included in our series, 32 by reason of having had heart failure in pregnancy and 2 by reason of a history of prior failure (with auricular fibrillation present in one of the latter), constitute 25.6 per cent of the whole series. They contributed 26.3 per cent of the women pregnant again and 25.5 per cent of the later pregnancies. The 32 patients recorded as having been in Class II prior to pregnancy, 25 of these admitted to this series by reason of having had failure in pregnancy and 7 by reason of histories of prior cardiac decompensation, constitute 24 per cent of the whole series and contributed 28.9 per cent of the group of women with subsequent pregnancies and 27.5 per cent of the later pregnancies. The 57 patients recorded as having been in Class III or IV at the time of conception and admitted into the series by reason of this fact alone (although 38 had the added criterion of decompensation in pregnancy and 8 others gave a history of prior failure) constitute 42.8 per cent of the whole series and contributed 39.5 per cent of the patients with later pregnancies and 39.2 per cent of the subsequent pregnancies. These figures, we believe, force acceptance of the conclusion that our series of women with pregnancies subsequent to the one which qualified them for inclusion in this series of "severe" rheumatic heart disease is not "loaded" in any direction.

TABLE II. PERCENTAGE DISTRIBUTION OF ALL PATIENTS WHO HAD LATER PREGNANCIES AND OF THE LATER PREGNANCIES IN RELATION TO THE FUNCTIONAL CLASSES PRIOR TO PREGNANCY

	CLASS PRIOR TO PREGNANCY			
	I	II	III AND IV	UNKNOWN
All cases (133), per cent	25.6	24.0	42.8	7.6
Patients with later pregnancies (38), per cent	26.3	28.9	39.5	5.3
Later pregnancies (51), per cent	25.5	27.5	39.2	7.8

The constitution of the series and the remote mortalities are shown in Table III. The remote mortality in the Class I patients was 29 per cent, with an annual death rate of 23.7. In the 1937-1942 series[6] the annual death rate for Class I cardiac patients was 17.7. The remote mortality in Class II patients was 72 per cent with a remote annual death rate of 80.2 per thousand. In our previous study[6] we found an annual death rate of 33.6 for Class II patients. The remote mortality for patients in Classes III and IV was 65 per cent. The remote annual death rate was 72.9. In our previous study we found an annual death rate of 71.3 for Class III and IV patients. It may be noted here that the remote mortality in the Class II patients is as high as that in Class III and IV patients, suggesting that the severity of the heart disease in many of the former was actually underrated. The alternative explanation, that the patients classed as III and IV might have been overrated from Class II, is not tenable for in our 1937-1942 series[6] where the classification was more accurately known the annual death rate for Class II patients was 33.6. Taking all of the patients together, 58 per cent have died in an average period of ten years after the pregnancy at the Margaret Hague in which they first were graded as having severe heart disease. The remote annual death rate was 58.3 per thousand. Table IV gives the over-all picture of this study. Ninety-five patients had no pregnancy subsequent to the one which qualified them to be classified as having severe heart disease; 38 patients did have one or more pregnancies after qualifying for inclusion in this series. In the "later pregnancy" group 50 per cent have died; 61 per cent are dead in the "no later pregnancy"

group. The annual death rate is 45.1 in those with further pregnancies as compared with 64.5 per thousand in the women who had no further pregnancies. It thus appears that subsequent pregnancy has not adversely affected longevity despite the hazards of the pregnancies themselves.

TABLE III. CLASS PRIOR TO PREGNANCY IN RELATION TO REMOTE MORTALITY

	CLASS PRIOR TO PREGNANCY				TOTAL
	I	II	III AND IV	UNKNOWN	
Cases	34	32	57	10	133
Dead	10	23	37	7	77
Mortality, per cent	29	72	65	70	58
Annual death rate per 1,000	23.7	80.2	72.9	68.6	58.3

TABLE IV. SEVERE RHEUMATIC HEART DISEASE, WHOLE SERIES (133 CASES)

	CASES	PERCENTAGE DEAD	MEAN YEARS OF SURVIVAL*	MEAN AGE AT DEATH*	MEAN AGE, SURVIVORS	ANNUAL DEATH RATE	LIVING BABIES†
No later pregnancy	95	61	9.5	36.2	43.4	64.5	80
Later pregnancy	38	50	11.1	34.4	41.0	45.1	75

*With 56 patients still alive, 37 without and 19 with later pregnancies.
†Present and later pregnancies.

We thought it might be of interest to pick out from the series as a whole several especially severe subgroups for particular attention. We wish to show at this point a break-down of distribution of patients in these subgroups (Table V). Patients with mitral and aortic lesions (17 in all), as distinguished from those with mitral stenosis alone, comprise 12.8 per cent of the whole series and contributed 13.2 per cent of the patients with later pregnancies. Patients with auricular fibrillation, 15 women, make up 11.3 per cent of the whole series, and contributed 5.3 per cent of the patients with subsequent pregnancies. Those women who had decompensation in the first trimester of pregnancy, 18 in number, make up 12 per cent of the whole series and gave 13.2 per cent of the group of women who had later pregnancies. The especially severe subgroup, Class III or IV at conception with a history of prior failure, 29 cases, constituted 21.8 per cent of the whole series and contributed 21.1 per cent of the women with subsequent pregnancies. The 25 patients who fulfilled three or all four of the criteria for severity constitute 18.8 per cent of the whole series and contributed 18.4 per cent of the cases with later pregnancies. Again we think the conclusion must be accepted that the two groups we have set up for comparison, women with no later pregnancies to women with subsequent pregnancies, are not "loaded" in either direction.

TABLE V. PERCENTAGE DISTRIBUTION OF ALL PATIENTS, OF PATIENTS WHO HAD LATER PREGNANCIES, AND OF THE LATER PREGNANCIES IN RELATION TO SUBGROUPS OF ESPECIALLY SEVERE CARDIAC IMPAIRMENT

	MITRAL STENOSIS PLUS AORTIC LESION	CLASS III OR IV PLUS HISTORY OF FAILURE	AURICULAR FIBRILLATION	FIRST TRIMESTER DECOMPENSATION	3 OR 4 CRITERIA OF SEVERITY
All cases (133), per cent	12.8	21.8	11.3	12.0	18.8
Patients with later pregnancies (38), per cent	13.2	21.1	5.3	13.2	18.4
Later pregnancies (51), per cent	9.8	15.7	5.9	9.8	13.7

The relation of the valvular lesions to the remote mortality is shown in Table VI. While the addition of an aortic lesion to mitral stenosis does not seem to affect the prognosis during pregnancy, it apparently does increase the remote mortality. The annual death rate in the 17 patients who had aortic lesions was 105.8 as against the rate of 53.4 in those with mitral stenosis alone. In patients with no later pregnancy the mean interval from discharge to death or follow-up was 6.8 years while it was 7.0 years in those who had later pregnancies. The annual death rate was 116 in the "no later pregnancy" group as compared to 81 per thousand per year in those women who assumed the risk of future pregnancies. It does not appear that subsequent pregnancy adversely affected longevity.

TABLE VI. MITRAL AND AORTIC DISEASE COMPARED TO MITRAL STENOSIS ALONE

	MITRAL STENOSIS AND AORTIC DISEASE, ALL CASES	MITRAL STENOSIS ALONE, ALL CASES	MITRAL STENOSIS AND AORTIC DISEASE	
			NO LATER PREGNANCY	LATER PREGNANCY
Cases	17	116	12	5
Mean years of survival	6.9	10.4	6.8	7.0
Annual death rate	105.8	53.4	116	81

Auricular fibrillation has been recognized as carrying a poor prognosis and this is reaffirmed in Table VII. Seventy-three per cent of the patients who had fibrillation during pregnancy have died, with an annual death rate of 86.8 as compared to 55.3 in those with regular sinus rhythm. Four of them, however, are still alive with fibrillation, at a minimum of nine years and one at nearly sixteen years after the pregnancy in which fibrillation was detected. The average length of life in this group has been 7.8 years, with the 4 still living to prolong the final average. Six lived for more than ten years. There were too few patients with auricular fibrillation who went on to future pregnancy to warrant conclusions but the table shows our experience. The 2 women pregnant again are dead at an average of 10.0 years after discharge. The mean interval from discharge to death or follow-up was 7.5 years for the women who had no later pregnancy, with 4 still alive. Apparently longevity was not adversely affected by subsequent pregnancy.

TABLE VII. AURICULAR FIBRILLATION COMPARED TO NORMAL SINUS RHYTHM

	AURICULAR FIBRILLATION, ALL CASES	NORMAL SINUS RHYTHM, ALL CASES	AURICULAR FIBRILLATION	
			NO LATER PREGNANCY	LATER PREGNANCY
Cases	15	118	13	2
Mean year of survival	7.8	10.3	7.5	10.0
Annual death rate	86.8	55.3	87	(95)

Patients with cardiac impairment so severe as to lead to decompensation in the first trimester might be expected to have a poor prognosis. Eighteen such patients were discharged. Table VIII indicates that 13, or 72 per cent, of these have died, with an annual death rate of 96.0 as against 54.0 in patients who escaped cardiac failure in the first trimester. Five patients had five later pregnancies. The average duration of life since discharge from the hospital has been 6.5 years. The death rate is 112 for those who had no later pregnancy as compared to 68 per thousand per year in the women who assumed the risk of a future pregnancy. In this subgroup again, longevity was not adversely affected by subsequent pregnancy.

TABLE VIII. FIRST TRIMESTER DECOMPENSATION

	FIRST TRIMESTER DECOMPENSATION, ALL CASES	REST OF SERIES, ALL CASES	FIRST TRIMESTER DECOMPENSATION	
			NO LATER PREGNANCY	LATER PREGNANCY
Cases	18	115	13	5
Mean years of survival	7	10.5	6.5	8.4
Annual death rate	96	54	112	68

A separate analysis was made of those women who were in Class III or IV at conception and who also had a history of prior decompensation (Table IX). Of 29 such cases, 20, or 69 per cent, are dead. The annual death rate was 83.1 as against 52.8 for the rest of the series. The average duration of life since discharge from the hospital has been 7.5 years in those with no later pregnancy and 8.8 years in those with later pregnancies. The death rate is 95 for those with no later pregnancy as compared to 55 per thousand per year in the women who assumed the risk of a future pregnancy. And thus again in this subgroup longevity was not adversely affected by subsequent pregnancy.

TABLE IX. CLASS III OR IV AT CONCEPTION PLUS HISTORY OF FAILURE

	CLASS III, IV, PREVIOUS FAILURE, ALL CASES	REST OF SERIES, ALL CASES	CLASS III OR IV WITH PREVIOUS FAILURE	
			NO LATER PREGNANCY	LATER PREGNANCY
Cases	29	104	21	8
Mean years of survival	7.8	10.6	7.5	8.8
Annual death rate	83.1	52.8	95	55

It is important at this point to restate for emphasis that Table V summarized the distribution of the patients in the various subgroups, discussed above, and showed the proportions of patients pregnant again and the proportions of later pregnancies in the subgroups. To restate, the later pregnancies have been proportionately distributed in these subgroups and therefore patients with later pregnancies are representative; there has been no loading of the group pregnant again by undue proportions of patients with milder cardiac impairment.

TABLE X. COMPARISON OF PATIENTS STERILIZED WITH THE OTHERS WHO HAD NO LATER PREGNANCY

	CASES	PERCENTAGE DEAD	MEAN YEARS OF SURVIVAL*	MEAN AGE AT DEATH*	MEAN AGE, SURVIVORS	ANNUAL DEATH RATE
Sterilized	22	64	10.0	37.5	42.0	62.6
Other patients with no later pregnancy	73	61	9.4	35.6	43.8	65.3
Patients with later pregnancy	38	50	11.1	34.4	41.0	45.1

*With some patients still alive.

Twenty-two of these patients were sterilized because of their severe heart disease. The astute reader who is aware of the conservatism of the Margaret Hague Maternity Hospital may surmise that these patients were more seriously compromised by their disease and that perhaps our "no later pregnancy" group is heavily weighted by them. This suspicion is dispelled by Table X which clearly shows that the sterilized patients are quite comparable to the other women who had no later pregnancy. There are no significant differences at follow-up in the percentages dead, annual death rates, mean

years of survival, mean ages at death (of those dead), or mean ages of survivors. Actually, this might be expected: sterilization, per se, is not acceptable to adherents of the religion represented by about 85 per cent of the women delivered at the Margaret Hague. Tubal ligations follow the patients' permissions and for that reason they approach random distribution in the whole series of severe cardiac patients. As has already been developed, we can discern no real difference in the constitutions of the "no later pregnancy" and "later pregnancy" groups.

It occurred to us that a possible answer to these "impossible" results might be in the age factor. Perhaps the "later pregnancy" group comes from the younger patients and, regardless of the criteria used and subgroupings sampled, if this were true our analysis might be subject to criticism. Table XI shows the relationship of age to remote mortality. We divided the series into five-year age groups and again compared the women who had no pregnancy subsequent to the time her heart disease would be accepted as "severe" with the patients who did have one or more subsequent pregnancies. In each five-year period the "later pregnancy" series has a lower mortality percentage. In Table XII we see that later pregnancies are more frequent in younger patients but it is also evident that this is not the explanation for the lower mortality in those with later pregnancies. The data show that in all age brackets the annual death rate is lower in patients who assumed the risk of added pregnancies. Again the evidence is that subsequent pregnancies have not adversely affected longevity in patients with rheumatic heart disease.

TABLE XI. AGE IN PREGNANCY AND LATER PREGNANCIES IN RELATION TO REMOTE MORTALITY

	AGE IN PREGNANCY (YEARS)						TOTAL
	15-19	20-24	25-29	30-34	35-39	40-44	
No Later Pregnancy.—							
Cases	0	17	36	22	18	2	95
Dead	–	10	21	12	13	2	58
Mortality per cent	–	59	58	55	72	100	61
Later Pregnancy.—							
Cases	4	10	13	6	4	1	38
Dead	2	5	6	3	2	1	19
Mortality per cent	50	50	46	50	50	100	50

TABLE XII. COMPARATIVE REMOTE MORTALITIES IN PATIENTS WITH AND WITHOUT LATER PREGNANCIES IN RELATION TO AGE IN INITIAL PREGNANCY

AGE IN INITIAL PREGNANCY	24 OR LESS	29 OR LESS		30 OR MORE	
		WHOLE FOLLOW-UP	EXCLUDING FIRST 5 YEARS OF FOLLOW-UP	WHOLE FOLLOW-UP	EXCLUDING FIRST 5 YEARS OF FOLLOW-UP
No Later Pregnancy.—					
Cases	17	53	42	42	30
Dead	10	31	20	27	15
Annual death rate	66.5	60.4	74.0	70.4	52.9
Later Pregnancy.—					
Cases	14	27	24	11	8
Dead	7	13	10	6	3
Annual death rate	48.8	43.1	58.5	50.9	44.8

The soundest approach to any problem involving mortality is the calculation of annual death rates and for this reason our analytical study has been presented in this form. An exception might be taken to this analysis, however; although the figures show that the annual death rate is not influenced in

an adverse manner by further pregnancies, perhaps the progressive deterioration inherent in the natural history of rheumatic heart disease has been accelerated by subsequent pregnancy. It was shown in a previous study that, if anything, later pregnancies decelerated the course of rheumatic heart disease. Table XIII again illustrates that even in patients with severe heart disease by the criteria used, later pregnancies have resulted in no accelerated deterioration. In each class the percentage of living-and-worse or dead is smaller in the patients who assumed the risk of future pregnancies than it is in patients who had no later pregnancy. This is true in all except Class II patients. This again suggests, as stated above, that in a number of these patients the functional class prior to pregnancy was actually underrated. The over-all figure, in any case, is again in favor of the "later pregnancy" group, 63 per cent to 77 per cent.

TABLE XIII. PROGRESSION OF CARDIAC IMPAIRMENT IN RELATION TO LATER PREGNANCY

	CLASS PRIOR TO PREGNANCY				TOTAL
	I	II	III AND IV	UNKNOWN	
No Later Pregnancy.—					
Cases	24	21	43	7	95
Living and worse or dead, per cent	79	72	77	71	77
Later Pregnancy.—					
Cases	10	11	14	3	38
Living and worse or dead, per cent	60	82	50	67	63

Summary and Conclusions

With proper care practically every pregnancy encountered in a patient with rheumatic heart disease can be brought to a successful termination.

A follow-up study of patients with "severe" rheumatic heart disease is reported. An analysis of 133 women examined eight and one-half to twenty-one years after delivery forces the conclusion that childbearing does not accelerate the rheumatic process even in women with advanced disease. Analysis of samples of smaller subgroups of increased severity yielded consistently the same conclusion.

Despite the hazards of the pregnancies themselves, one or more pregnancies subsequent to the time that advanced heart disease was recognized did not increase the annual death rate.

In short, longevity even in patients with severe rheumatic heart disease is not adversely affected by childbearing.

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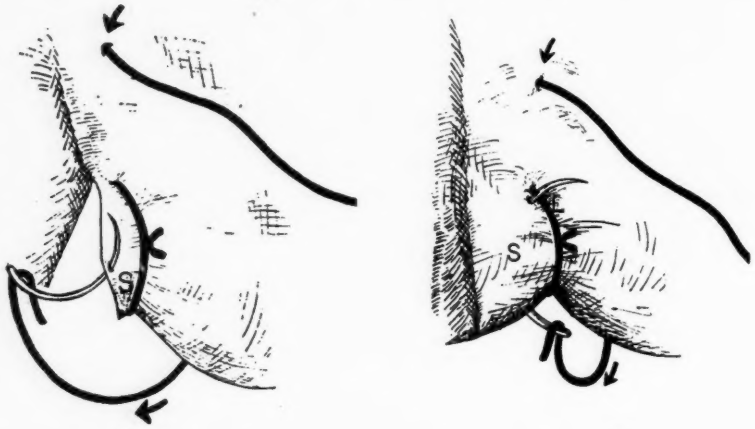
SIMPLIFIED TECHNIQUE OF TOTAL HYSTERECTOMY WITH BRIDGE CLAMP AND STUMP STITCH

ROBERT TAUBER, M.D., PHILADELPHIA, PA.

(From the Graduate School of Medicine, University of Pennsylvania)

THE presented technique of total hysterectomy comes as a result of further studies of prophylactic hemostasis which requires (1) that the tissue be ligated *before* it is dissected, and (2) that the ligatures be placed close to one another. The first requirement could be met by using the embracing cylinder clamp,[1] but the placing of the ligatures in close proximity to one another presents unexpected difficulties. It was found that the originally recommended technique, with the "transverse cut,"[1] called for the use of additional instruments to control occasional reflux bleeding, with the result that the accessibility of the operating field became prohibitively diminished.



A. *B.*

Fig. 1.—*A*, The incorrect stump stitch without any hemostatic effect: After the ligated tissue has been dissected the needle can pick up hardly more than the edge of the retracted stump (*S*).

B, The correct stump stitch is readily passed through the entire thickness of the "stump-to-be" (*S*) close to the ligature *before* the ligated tissue (*S*) has been dissected.

Another way of placing the ligatures close together is by means of the stump-stitch technique, which consists in first encircling with the needle the tissue which is to be ligated, and then passing the suture through the previous stump at a point close to its ligature (Fig. 1, *B*). The stump-stitch technique obtained excellent results in vaginal hysterectomy,[2] but could not be employed when the abdominal approach was chosen. The retracted stump left a comparatively short piece of tissue in front of the ligature, with the result that the needle could not be properly passed through the stump, most particularly

in the deeper regions of the pelvis. It frequently proved impossible to pick up more than a small fraction of the retracted tissue (Fig. 1, *A*), and, of course, it is necessary to penetrate the entire thickness of the stump to achieve perfect hemostasis. The opportunity, however, to eliminate the transverse cut by using the stump stitch, and thus appreciably reducing the number of instruments required, appeared so tempting that intensive studies on cadavers and models were carried out, in order to discover a technique of placing the stump stitch in a suitable and satisfactory manner.

After many fruitless experiments, an incredibly easy and fully satisfactory solution to this technical problem was found—namely, *the needle must be passed through the ligated tissue before* it is dissected (Fig. 1, *B*). Thus, the routine order has simply been reversed; instead of following the habitual procedure of cutting the ligated tissue, to begin with, and then trying vainly to pass the needle properly through the retracted stump, the needle is now readily passed first through the "stump-to-be," namely, the ligated but undissected tissue which is severed afterward.

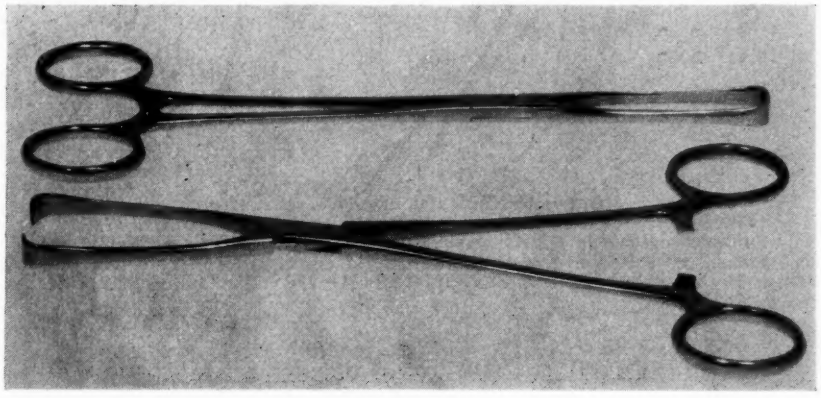


Fig. 2.—The bridge clamp* is the new embracing clamp with the increased capacity.

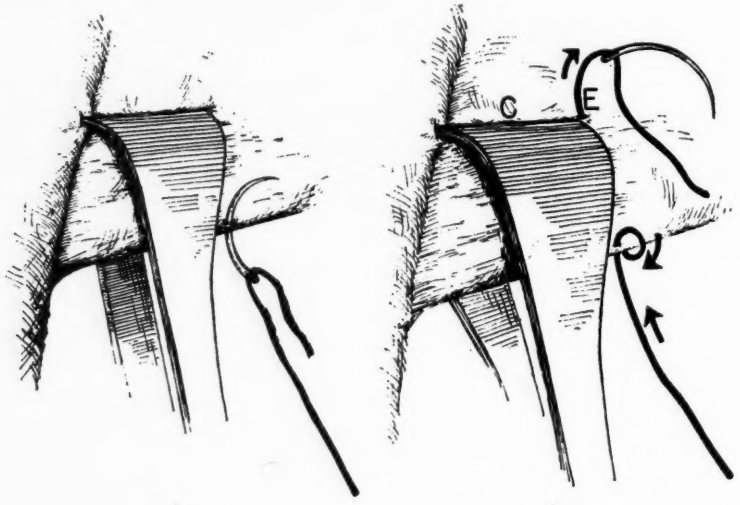
When dissection of the ligated parametrium was omitted it became necessary to increase the capacity of the original cylinder clamp. This was done by giving the blades the shape of a bridge (Fig. 2), thus permitting them to embrace both the ligated *and* the unligated tissue simultaneously, with one and the same bite (Fig. 4).

New Technical Elements

1. The "Special Mattress Suture."—The suture which is passed through the parametrium twice, in opposite directions, is a special mattress suture, composed of two distinct stitches—namely, the *embracing stitch* which is placed at the lateral end of the closure line of the bridge clamp (Fig. 4), and the *stump stitch* which is passed in the opposite direction close to the ligature of the previously ligated, but undissected tissue (Fig. 4). It matters little whether the embracing stitch (Fig. 4, *A*) or the stump stitch (Fig. 4, *B*) is made first; the choice will be made according to circumstances. It is imperative, however, that the first of the two stitches be done in the anteroposterior direction, so that the knot may be tied and placed in front of the tissue (Fig. 4, *A* or *B*).

*Manufactured by Charles Lentz and Son, 33 South 17th St., Philadelphia 3, Pa.

2. The Anchored Suture.—Ligatures around a free edge[1] should be anchored in order to prevent the ligature from slipping along the free edge (Fig. 3). Here again the needle is passed through the tissue twice, but both times in the same direction, from back to front. The first stitch, the so-called anchoring stitch, picks up only a small piece of tissue, and the embracing stitch is placed in the routine way at the lateral end of the closure line of the bridge clamp (Fig. 3).

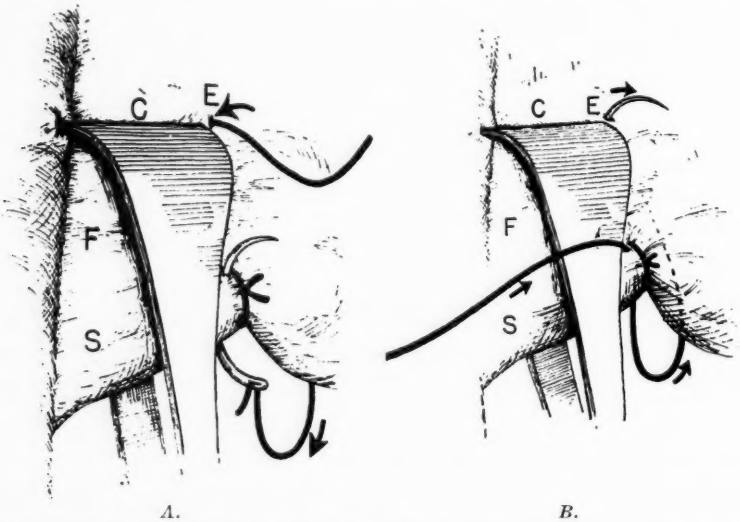


A. *B.*

Fig. 3.—The anchored suture.

A, The anchoring stitch is placed around the free edge laterally to the bridge clamp.

B, The embracing stitch is placed at the lateral end (*E*) of the closure line (*C*) of the bridge clamp. Both stitches are passed through the tissue in the same direction.



A. *B.*

Fig. 4.—The special mattress suture. The ligated tissue (*S*) as well as the following unligated tissue (*F*) has been encircled with the same bridge clamp.

A, The embracing stitch is made first. It starts anteriorly at the lateral end (*E*) of the closure line (*C*) of the bridge clamp; the stump stitch follows and runs in the opposite direction through the ligated but undissected tissue (*S*).

B, The stump stitch is made first; it starts anteriorly and runs through the ligated but undissected tissue (*S*). The following embracing stitch is passed in the opposite direction through the tissue at the lateral end (*E*) of the closure line (*C*) of the bridge clamp.

Complete Technique of Total Hysterectomy

The abdomen is opened and the bladder separated from the cervix. A bridge clamp encircles the right tube and the right ovarian ligament or the right infundibulopelvic ligament, if the adnexa are to be removed. The first suture ligature is anchored (Fig. 3), tied, and left long. *The ligated tissue must not be dissected.* The bridge clamp is opened and the round ligament included in the same bite. The stump stitch is passed through the ligated portion in anteroposterior direction and close to the ligature, and the embracing stitch follows in the opposite direction through the adjacent, unligated portion of the broad ligament at the lateral end of the closure line of the bridge clamp (Fig. 4). The ligature is tied and the bridge clamp is then removed. Reflux clamps are placed, and the ligated tissue is separated from the uterus. The avascular area of the broad ligament is gently forced downward, and thus a new artificial edge is created. The portion of the parametrium which includes the uterine artery is encircled with the bridge clamp. The subsequent suture ligature is anchored (Fig. 3). The ligature is tied, but the ligated tissue surrounding the uterine artery *must not be dissected* at this time. The bridge

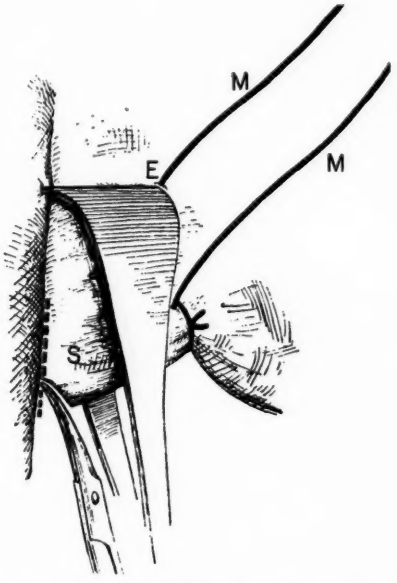
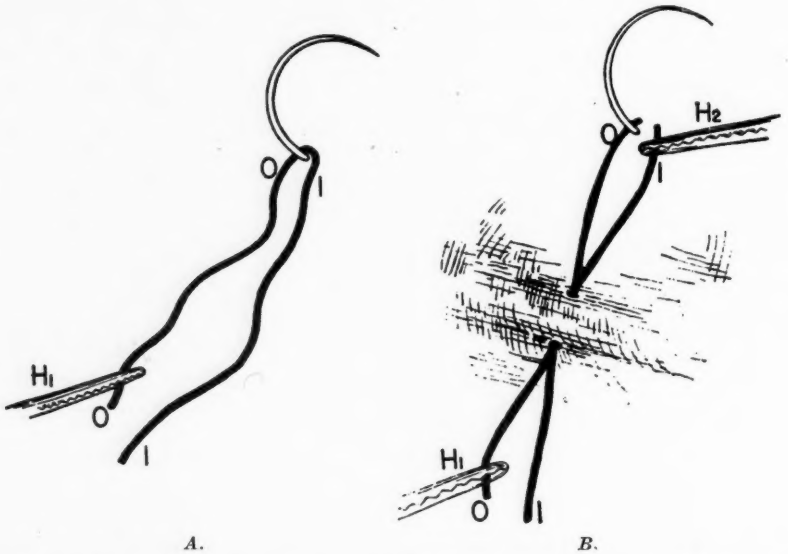


Fig. 5.—The separating cut. The special mattress suture ($M-M$) has been placed by technique *A* or *B* (Fig. 4). Before tying $M-M$ the tension is reduced by the dissection of the ligated tissue (*S*) along the dotted line.

clamp is removed and used for the same steps on the left side. As soon as the left uterine artery has been ligated, all reflux clamps are taken off. *Without extending the separating cut,* the bridge clamp is opened and the adjacent, unligated portion of the parametrium is included in the bite. The stump stitch and the embracing stitch are made (Fig. 4). Before the placed ligature *M—M* (Fig. 5) is tied, the previously ligated portion of the parametrium is dissected, in order to have a minimum of tension in the tissue when the new ligature is tied (Fig. 5). The bridge clamp is opened and the uterosacral ligament is included in the last bite. The stump stitch and the embracing stitch are made in the same way as before (Fig. 4, *A* or *B*), the separating cut is extended through the ligated portion of the parametrium, and the placed ligature is tied

(Fig. 5). If no stump stitch is to follow, the separating cut may be extended to the end of the bridge clamp. *The bridge clamp must not be removed.*

A second bridge clamp is used to continue with the same steps on the right side. After ligating the last bite, which includes the uterosacral ligament, the clamp is left in place because here—and here only—the closure line of the bridge clamp has a hemostatic function. The vagina is opened and the uterus removed. A separate, simple mattress suture must be made around the closure line of each bridge clamp, in order to prevent bleeding from the so-called bloody angle and the paravaginal tissue.[1] A running suture takes care of the edge of the vagina, leaving an opening in the center. The stumps are covered with peritoneum and the abdomen is closed, layer by layer.



A. *B.*

Fig. 6.—Retying technique and determination of the corresponding ends of the ligatures.

A, The tagged double suture. The length of the thread is the same on each side of the needle (double suture). The free end of the ligature at the outside of the needle (*O*) (outside ligature) is tagged by the nurse with a hemostat (H_1).

B, The tagged double suture has been passed through the tissue. The inside ligature (*I*), which is readily identified at the inside of the needle eye, is picked up with a hemostat (H_2) and cut off close to the needle. The result is that there are two ligatures in the same stitch canal. Each ligature is tagged on one end which corresponds with the free end on the other side of the encircled tissue.

Comment

A supracervical hysterectomy can be performed, if necessary, without the use of a clamp. For total hysterectomy, however, clamps are indispensable, for the reason that the procedure of passing the needle through uncontrolled tissue, deep in the pelvis, is difficult and dangerous. Countless types of clamps have been designed for this operation. They are of infinite variety and shape: some are flat; some are furnished with teeth; some have longitudinal, some transverse, some oblique serrations; but all these instruments may be classified as *crushing* clamps, and the tissue can be ligated only after it has been dissected. The concept of prophylactic hemostasis, however, requires that the tissue be ligated *before* it is dissected. This problem has now been solved by the *embracing* cylinder clamp[1] which has been modified by giving the blades the

shape of a bridge. With the new bridge clamp, both the unligated and the previously ligated, but undissected, portion of the parametrium can be encircled in the same bite. This is essential for the correct application of the embracing stitch and the stump stitch.

Retying.—The danger of having the ligature slip is eliminated, because each ligature is secured in two stitch canals. It is easy to ligate any structure twice, however, if desired, simply by doubling the suture in the needle (Fig. 6, *A*). One-half of the suture is "inside" (in the concavity of the needle), the other half "outside." The free end of the "outside ligature" is tagged with a hemostat. After the needle has been passed through the tissue the ligatures are readily recognized on the inside and the outside of the needle eye (Fig. 6, *B*). It is not necessary, therefore, to pull on the ligature in order to identify the corresponding ends; nor is it even possible to do any such pulling when dealing with an anchored suture.

Summary

The technique of prophylactic hemostasis in total hysterectomy has been considerably simplified by the drastic reduction of instruments and the elimination of the transverse cut. The new features presented in this paper are: (1) the bridge clamp with increased capacity, capable of embracing both the ligated and the adjacent unligated tissue; (2) a new method of employing the stump-stitch technique in abdominal hysterectomy, namely, by placing the stump stitch *before* dissecting the ligated tissue; and (3) the retying procedure, using the tagged double suture and the needle eye for identification of the corresponding ends of the ligatures.

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2019 Walnut Street

STRESS INCONTINENCE IN YOUNG NULLIPAROUS WOMEN

A Statistical Study

ALMA NEMIR, M.D., AND RICHARD P. MIDDLETON, M.D., SALT LAKE CITY, UTAH

(From the University of Utah Medical School)

STRESS incontinence in women is usually considered by the medical profession to be a result of childbearing. The mechanism of this loss of control is usually explained on the basis of sagging of and injury to the muscular and ligamentous structures of the urogenital triangle of the perineum.

Observations by one of us in the practice of urology (R. P. M.) and the other (A. N.) as medical consultant and health educator at the University of Utah have led us to question this assumption as a comprehensive and adequate explanation. It seemed to us that an appreciable number of nulliparous young women seek medical advice because of stress incontinence. An opportunity for investigating the incidence of this complaint was immediately at hand in the University.

Method

To determine the amount of stress incontinence in young nulliparous women under various forms of provocation, the questionnaire given in Table I was submitted to successive (required) Freshmen Health Education classes

TABLE I. QUESTIONNAIRE

Do you lose control of your urine under the following circumstances?

Coughing: Slight loss
Moderate loss
Severe loss

Occasionally____ Frequently____

Sneezing: Slight loss
Moderate loss
Severe loss

Occasionally____ Frequently____

Laughing: Slight loss
Moderate loss
Severe loss

Occasionally____ Frequently____

Excitement: Slight loss
Moderate loss
Severe loss

Occasionally____ Frequently____

Age_____ Single?_____ Married?_____ Children?_____

for women over a period of the last three years. These are almost all of the women who have entered the University within this space of time. Since most of the girls were single and nulliparous and our interest lay primarily with this group, only their answers were tabulated. Replies were anonymous. As far as could be determined, all students present responded to the questionnaire. In describing the purpose of the questionnaire, emphasis was laid upon actual uncontrolled loss of urine, differentiating it from the complaint of frequency and urgency.

Results

A summary of the findings from the questionnaire is shown in Table II.

As will be noted, nearly all of the students were adolescents in the 17-to-21 year age group. Among 1,327 young women, 695 (52.4 per cent) admitted some degree of stress incontinence. Of these, 660 (95 per cent) were troubled only occasionally, but 35 (5 per cent) experienced frequent loss. Almost all of the girls said that the loss was small. Six hundred thirty-two (47.6 per cent) of the young women stated that they were not troubled at any time with stress incontinence.

As regards the provocations for stress incontinence, it is interesting to note that laughing was most frequently mentioned. A detailed analysis of the provocative factors is given in Table III.

TABLE II. INCIDENCE OF CONTINENCE AND INCONTINENCE BY AGES

AGE	NO LOSS OF URINE	LOSS OF URINE
17 and under	65	87
18	257	265
19	170	214
20	56	78
21	42	24
22	12	8
23	11	5
24 and over	11	8
No age recorded	8	6
Total	632	695
	47.6%	52.4%

TABLE III. INCIDENCE OF STRESS INCONTINENCE FROM VARIOUS PROVOCATIVE FACTORS

Occasional Loss.—	
Laughing only	247
Excitement only	69
Sneezing only	27
Coughing only	14
Laughing and excitement	98
Coughing, sneezing, excitement, and laughing	94
Various other combinations	111
Total	660
Frequent Loss.—	
Laughing	12
Coughing	1
Sneezing	1
Excitement	9
Laughing and excitement	10
Laughing, coughing, sneezing, and excitement	2
Total	35

Comment

As far as we can determine, these are the first statistics to be offered on the incidence of stress incontinence in young nulliparous women. Many medical writers mention the occasional loss of urine in women from the provocations previously mentioned, but emphasis is usually laid on weakness and stretching of the muscles involved in the control of urine from the effects of childbearing. Our investigation suggests that the female sphincter may be innately less competent than its male counterpart.

In our study, no follow-up was done on the women who supplied data for the questionnaire. We can state, however, as a result of University entrance health examinations to which all had submitted, that none suffered any manifest neurological or anatomical disturbance which would affect urinary control.

Summary and Conclusions

An anonymous questionnaire on stress incontinence of urine was submitted to 1,327 young, single, nulliparous college women in required Health Education classes at the University of Utah. Stress incontinence was present in 695 (52.4 per cent) of these young women and was described as frequent by 35 (5 per cent). The chief provocative factor was laughing; excitement ranked second; and coughing and sneezing seemed less likely to cause loss of urine.

These data are at variance with statements about stress incontinence in current medical literature and therefore deserve publication.

We conclude that stress incontinence cannot be ascribed solely to childbearing, since it has a very high incidence in healthy, unmarried, nulliparous young women.

PRIMARY ADENOCARCINOMA OF THE FALLOPIAN TUBE

IRA GOLDBERG, M.D., AUGUSTA, GA.

(From the Division of Obstetric and Gynecology, Mount Sinai Hospital, Cleveland, Ohio)

REVIEWING the literature in 1952, Carpenter and Jameson[2] reported 504 cases of primary tubal malignancy. Additional cases have been reported by the following:

Dickson, Lodge, and Woodcock,[3] Forbes,[5] McFayden,[8] and Johnson and Amos,[7] one case each; Calk and Phillips,[1] two cases; Efskind,[4] three cases, Weekes,[9] seven cases; and this paper will present two additional cases, making a total of approximately 522 cases.

The incidence of primary carcinoma of the Fallopian tube as reviewed in the literature ranges from 0.16 per cent to 0.5 per cent of primary pelvic malignancy, with approximately one-third of the cases bilateral. In this hospital there were two cases of primary tubal malignancy and 224 cases of primary pelvic malignancies from January, 1947, to June, 1953, giving an incidence of 1.2 per cent. This percentage is of course extremely high because of the short time covered, but unfortunately accurate figures are not available before 1947.

Primary malignancy of the Fallopian tube is the rarest but also the most malignant of the pelvic neoplasms. The age group of these patients has been reported from 18 years to 80 years with the majority between 40 and 65 years of age. The prognosis is extremely poor, with one author[8] stating that no more than 5 per cent obtain a five-year cure. Hu,[6] however, reported 40 per cent with five-year cures.

The preoperative diagnosis is very difficult and is seldom made. The most common symptoms which may aid in the preoperative diagnosis as described are irregular vaginal bleeding with an intermittent sudden release of fluid, low abdominal distress, and a palpable adnexal mass. A valuable aid may be the vaginal smear. Probably one reason for the poor over-all cure is the lapse of time before diagnosis. One point to be kept in mind in order to facilitate diagnosis of primary tubal malignancy is that surgical exploration is indicated in any unilateral mass in a menopausal or premenopausal woman that is associated with irregular bleeding and negative curettage.

The most frequent site of involvement is the distal two-thirds of the tube with the growth originating in the endosalpinx. Invasion of the tubal wall is usually a later occurrence. Metastasis may develop by continuity, transperitoneal migration, lymphatic and vascular channels.

Pathologically, there have been three criteria established for the diagnosis of primary tubal malignancy.[6] They are:

1. Grossly, the main tumor is in the tube.

2. Microscopically, chiefly the mucosa should be involved and should show a papillary pattern.

3. If the tubal wall is found to be involved to a great extent, the transition between benign and malignant epithelium should be demonstrable.

In operative cases the accepted treatment today is total hysterectomy and bilateral salpingo-oophorectomy. In addition roentgen-ray therapy is advocated by many and this may also be used for palliation in more advanced and in recurrent cases.

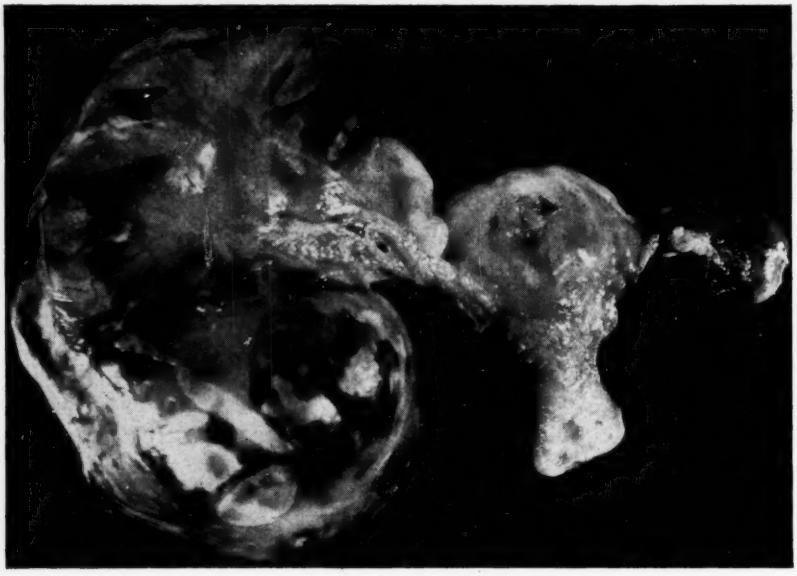

Fig. 1.—(Case 1, G. T.) Gross specimen of carcinoma of Fallopian tube.

CASE 1.—Mrs. G. T., a 70-year-old white woman, was seen in the outpatient department on March 20, 1953, at which time she complained of swelling in the right lower abdomen with pain radiating down the right leg, for a period of six months. She also gave a history of tarry stools but no red blood and for the previous five days she had had a slight amount of vaginal bleeding. Her past history was negative. The patient had reached the menopause at 52 years and this was the first bleeding since that time. She was nulliparous.

Physical examination was essentially negative except for pelvic examination which showed a normal cervix and the fundus to be atrophic and anterior, and freely movable. On the right side there was a soft, tender mass about 4 to 6 cm. in diameter. The left adnexa were negative. Impression at this time was carcinoma of the large bowel.

Complete x-ray study including gastrointestinal series and barium enema were negative. A Papanicolaou smear was reported to be suspicious for malignant cells. Following this the patient was admitted to the hospital for a diagnostic dilatation and curettage with the impression that she had an ovarian carcinoma. Curettage and examination under anesthesia confirmed the previous findings. The uterus was sounded to 3.5 cm. and a minimal amount of endometrial tissue was obtained; cervical biopsy was also done at this time. The report from the Department of Pathology showed a chronic cervicitis, and slight and cystic atrophy of the endometrium. Exploratory laparotomy was then done,

at which time an adenocarcinoma of the right Fallopian tube was found. The right tube itself was grossly dilated at its distal two-thirds and was adherent to the ovary, resembling an old hydrosalpinx (Figs. 1-3). A bilateral salpingo-oophorectomy and a total hysterectomy were performed. Postoperatively the patient did very well, being discharged on the seventh postoperative day.

She has been seen three times since the operation in our tumor clinic and at this date is doing very well.

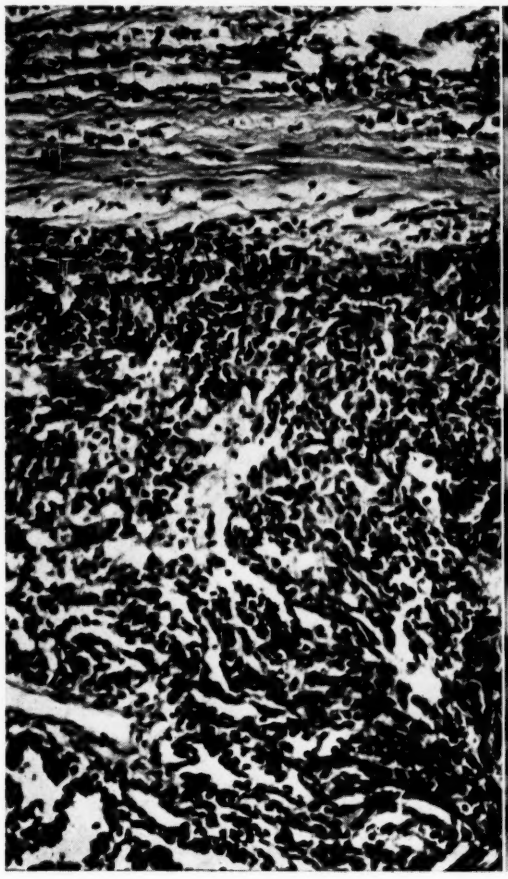

Fig. 2.

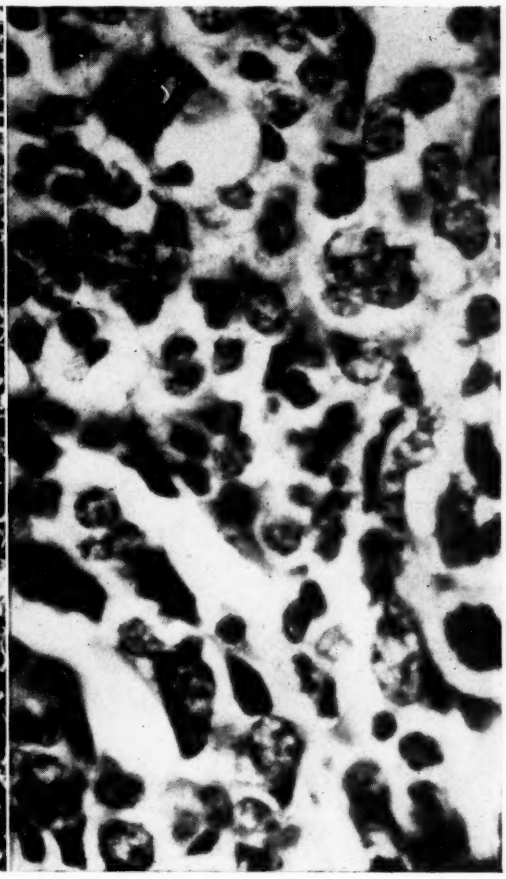

Fig. 3.

Fig. 2.—(Case 1, G. T.) Adenocarcinoma of right tube under low power.
Fig. 3.—(Case 1, G. T.) Adenocarcinoma of right tube under high power.

CASE 2.—Mrs. A. B., a 64-year-old white woman, gravida ii, para ii, was seen by her private physician in April, 1953, complaining of vaginal spotting of three days' duration. Two weeks prior to this she had noticed a vaginal discharge. She had no pain but complained of some soreness in the right lower abdominal quadrant. Her past history was negative, except for a cholecystectomy one year previously. The patient had reached the menopause at 55 years of age and this was the first episode of bleeding since that time. Except for a blood pressure of 186/100, physical examination was entirely negative. A diagnostic dilatation and curettage was done which revealed atrophy of the endometrium and was followed by exploratory laparotomy. Grossly the pelvic organs appeared normal. A bilateral salpingo-oophorectomy and a total hysterectomy were done and the pathology report showed

adenocarcinoma of the left Fallopian tube (Figs. 4 and 5). The patient did well postoperatively and was discharged on the eleventh postoperative day. She has been followed by her private physician postoperatively and at this time is doing very well.

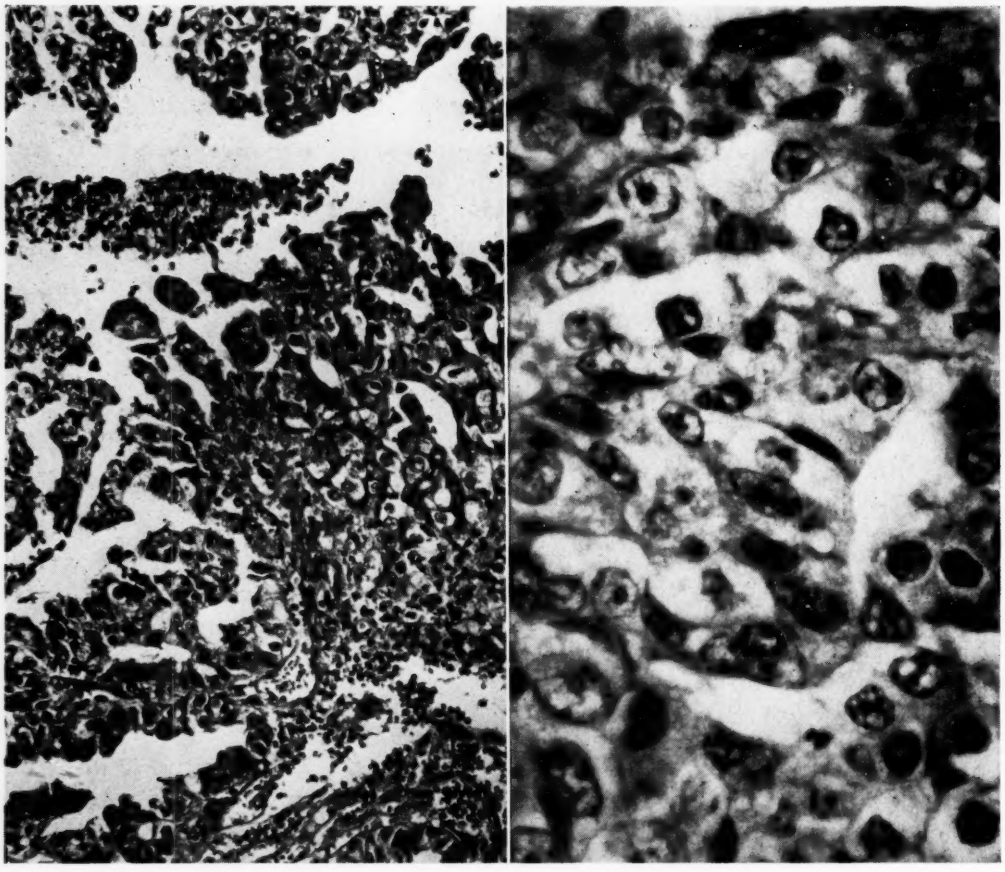

Fig. 4. Fig. 5.

Fig. 4.—(Case 2, A. B.) Adenocarcinoma of left tube under low power.
Fig. 5.—(Case 2, A. B.) Adenocarcinoma of left tube under high power.

Summary and Conclusions

1. The literature on primary malignancy of the Fallopian tubes was reviewed and two additional cases are presented. This brings the total of cases reported to date to approximately 522.

2. Carcinoma of the Fallopian tube is the rarest but most malignant of the pelvic neoplasms. Unfortunately it is too early to give any real follow-up report on the two cases presented here as they were both first seen within the past six months.

3. The diagnosis of malignancy of the Fallopian tube is very difficult to make preoperatively, this probably being one of the reasons for the poor prognosis. A triad of symptoms which may aid in the preoperative diagnosis was stated earlier in this paper. A further diagnostic aid may be the vaginal smear.

4. The accepted treatment today in operative cases is total hysterectomy with bilateral salpingo-oophorectomy, although postoperative radiation is advocated by many. Radiation is also indicated for palliation, for advanced cases, and for recurrent cases.

5. The most frequent site of involvement in these neoplasms is the distal two-thirds of the tube. This was true in both of the cases reported here.

6. Pathologically there have been three criteria established for the diagnosis of primary tubal malignancy. These were stated earlier in this paper.

7. In conclusion, in order to make earlier diagnosis and possibly to improve the prognosis one should keep in mind that surgical exploration is indicated in any unilateral mass in a menopausal or premenopausal woman that is associated with irregular bleeding and negative curettage.

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Department of Case Reports
New Instruments, Etc.

UTERUS BICORNIS UNICOLLIS VAGINA SIMPLEX

A Case Report

JOSEPH J. BRADLEY, M.D., F.A.C.S., ANTHONY E. COLOZZI, M.D., AND
ROBERT F. LINTHWAITE, M.D., CAMBRIDGE, MASS.

(From the Department of Obstetrics and Gynecology, Cambridge City Hospital)

CONGENITAL abnormalities of the female genital tract have been the subject of an increasing number of case reports in the recent literature. In his original article, Jarcho[1] stresses the high incidence of menstrual irregularities and obstetrical complications in patients with congenital malformations of the female genital tract. Miller[2] found severe dysmenorrhea an important diagnostic symptom of the double uterus. Masson and Rieniets[3] noted the tendency toward menorrhagia in cases of uterine anomalies and attributed the excessive bleeding to the increased area of endometrium. They found the incidence of abortions high (24 to 53 per cent) in patients with congenitally abnormal uteri. Premature rupture of the membranes occurred in almost one-half of the cases reported by Fenton and Singh.[4] An increased incidence of breech and transverse presentations is to be anticipated in such cases. Complications of parturition such as premature labor, uterine inertia, and adherent placenta are of frequent occurrence. Hoffman[5] reviewed this problem and found that abortion, premature labor, premature separation of the placenta, and placenta previa are not unusual complications of pregnancy. During labor he found complications, such as prolongation due to weak or deficient musculature, rupture of the uterus, or dystocia. Postpartum hemorrhage and retention of the placenta were common. Miller[2] reported retention complications in 17 per cent of his cases. Retained placentas requiring manual removal occurred in 9 per cent of the cases reported from the Sloane Hospital for Women.[4]

This case presents some of the clinical aspects of congenital malformation in the female genital tract and is of special interest in that it not only has curiosity value but demonstrates how seriously poor judgment and mishandling can threaten the life of an obstetric patient, for we note in her history: (1) complete inversion of the uterus with placenta attached, (2) cesarean section (indication, prior inversion) with ligation of tubes,

(3) pregnancy 18 months after tubal ligation, terminated by repeat cesarean section, and (4) uterine anomaly not recognized at two previous abdominal operations.

Mrs. E. D. was first seen in the gynecological outpatient department of the Cahill House on June 20, 1952, with a complaint of menorrhagia and metrorrhagia for approximately 5 months. These periods of bleeding were further complicated by a series of minor hemorrhagic episodes once or twice weekly.

Her past history revealed menarche at the age of 14. Her periods were normal as to duration and interval with moderately severe dysmenorrhea beginning the last day of the cycle and lasting for a few hours at onset of menses. She was married at the age of 17 and did not become pregnant for two years. Her first pregnancy was uneventful except for spontaneous premature rupture of the membranes at eight months' gestation. She leaked amniotic fluid for approximately one month and then delivered a 3 pound infant in March, 1933, after an eight-hour labor. Mother and baby did well.

Her next pregnancy terminated in December, 1934, when the membranes again ruptured about two weeks prematurely and she delivered a 6 pound infant after an eight-hour labor.

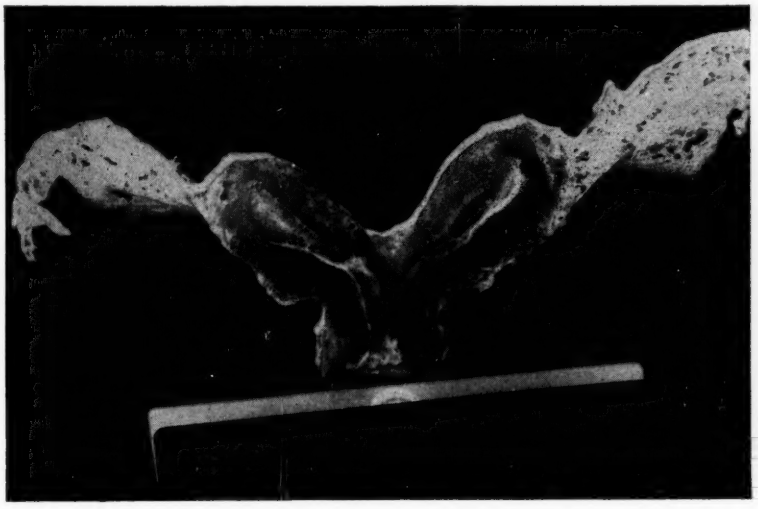

Fig. 1.—Coronal section of specimen removed.

Her third pregnancy resulted in a full-term 7 pound infant after a seven-hour labor in August, 1937. This delivery was complicated by a complete inversion of the uterus with the placenta attached at which time the placenta was stripped off and the uterus was completely and quickly replaced. There was neither shock nor hemorrhage and she was discharged from the hospital in seven days. In March, 1939, a cesarean section with "prior inversion" as the indication, was performed for her fourth pregnancy. At this time both tubes were ligated. However, she was pregnant within the year and again delivered by Cesarean section in October, 1940.

She had no miscarriages and other than an eight and one-half months' stay at a sanatorium for tuberculosis in 1941 her past history is irrelevant.

After her initial examination in the outpatient department, she was admitted to the house service and on June 24, 1952, under spinal anesthesia, a curettage and cervical biopsy were performed. One of the examiners felt what he thought was a fibroid, but the procedure was otherwise negative. The pathologist reported a secretory endometrium and chronic cervicitis.

She next appeared at Cahill House in February, 1953, complaining of increasing severity in bleeding. After being seen in the outpatient department she was admitted to Cahill House on Feb. 16, 1953, where, because of her age, parity, and the previous impression of fibroids with bleeding, it was decided to perform a laparotomy.

Upon opening the abdomen it was apparent that we were dealing with a congenital malformation of the uterus, our first impression that of a uterus didelphys. A total hysterectomy and bilateral salpingo-oophorectomy were performed. Closer examination showed a single cervix consistent with a diagnosis of uterus bicornis unicollis vagina simplex, with two large and very well-developed horns. During dissection of the bladder flap, extensive scarring over the lower portions of both isthmi offered presumptive evidence, at least, that each body might have been the site of a cesarean section.

Intravenous pyelograms failed to reveal any associated urological abnormalities. The patient had a normal convalescence and was discharged on the fifteenth hospital day.

Summary

A case of uterus bicornis unicollis vagina simplex is reported.

The menstrual irregularities and obstetrical complications associated with congenital malformations of the female genital tract are presented in brief. The patient in this instance complained of menstrual cycles which were characterized by dysmenorrhea, menorrhagia, and metrorrhagia. Her pregnancies were complicated by premature rupture of the membranes, premature labor, adherent placenta, and inversion of one horn of the bicornuate uterus. Any patient giving a history of menstrual irregularities and/or obstetrical complications should be investigated for congenital malformations of the genital tract. It is interesting to note that despite the two cesarean sections this abnormality was not noted. This case also demonstrates that the obstetrician should avail himself of the opportunity to explore the abdominal cavity or at least the genital apparatus when a laparotomy is done for a cesarean section in order to detect other coexisting pathology.

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A NEW INSTRUMENT FOR USE IN TOTAL HYSTERECTOMY

ANDREW J. SMATKO, M.D., LOS ANGELES, CALIF.

THE introduction of any new instrument often immediately causes the quizzical raising of eyebrows. The old saying, "There is nothing new under the sun," frequently applies to instruments as well as operations. In using the term "new," I do so with reservations because I have not thoroughly perused the literature on this subject. Ricci, in his comprehensive treatise on gynecologic instruments, reveals no similar instrument. It is probable that a few surgeons in this country have devised or thought of designing an instrument similar to mine, but have not introduced it to the surgical profession. I do claim full originality in design of my instrument, having worked out the details of the head over the past several months. My apologies are extended to anyone who may have described a similar instrument.

I have used the original model of the instrument which was made for me by V. Mueller and Company and it has lived up to all expectations. I propose to call it a "forniceal delineator" for reasons which will be seen to be obvious from the description of the instrument's use.

The delineator consists of a single instrument, having long handles, a body and a head piece. This latter consists of an anterior or upper spoon and a posterior or lower spoon. As seen in the illustration, both upper and lower spoons are made convex to fit the cervix. Each has three stout teeth, and in addition each has a curved groove in its anterior lip to serve as a guide in making a scalpel incision through the vaginal wall. The anterior spoon measures 30 mm. across, slightly less than the 31 mm. transverse measurement of the posterior spoon. The teeth are approximately 5 mm. long. The groove in the upper and lower spoon is 25 mm. long, 2.5 mm. wide, and 2 mm. deep. Each spoon is about 2 mm. thick. As seen in the illustration, the anterior spoon is about 4 cm. long and the posterior spoon about 4.5 cm. long. The total length of the instrument is about 28.5 cm. long. A regular box lock and five-groove ratchet is incorporated into the delineator as in many standard instruments. The delineator will be manufactured in stainless steel.

The forniceal delineator is an instrument to be used in total hysterectomy. It should not be applied to the cervix when this organ harbors a known or suspected carcinoma since preservation of vaginal length is not a consideration in a radical hysterectomy operation. Likewise, in operations where radical pelvic surgery is contemplated, this instrument would be of little value.

In the great majority of instances, however, where a total hysterectomy is to be done the forniceal delineator is particularly valuable. The original purpose in designing this instrument was to prevent vaginal shortening during the performance of a total hysterectomy. This purpose is achieved, but in addition other advantages soon became apparent. In patients with extensive endometriosis, particularly of the cul-de-sac, the forniceal delineator is decidedly helpful. In many such instances the performance of a total hysterectomy is abandoned in preference to the subtotal procedure because of the danger to the rectum which would be occasioned by dissection of dense cul-de-sac adhesions. Now, with the forniceal delineator in place, one should nearly always be able to dissect out the cervix with much greater assurance of safety. Naturally, no instrument obviates good

surgical technique, and this holds true here as well. Likewise, in instances where the bladder is densely adherent to the anterior vaginal wall, the delineator serves as a guide to dissection in this area, minimizing danger to this viscus.

Method of Use.—The delineator is clamped on the cervix via the vaginal route. If a dilatation and curettage is to be done, this procedure is completed, a single-toothed tenaculum is fixed into the right or left side of the cervix, and traction is applied. The area of the junction of the vaginal mucosa with the mucosa of the portio vaginalis of the cervix is noted and the forniceal delineator is so applied that the grooved upper plate of the head rests in the anterior cervicovaginal sulcus (anterior fornix). The instrument is then clamped snugly, the tenaculum removed, and the patient then is readied for the abdominal procedure.

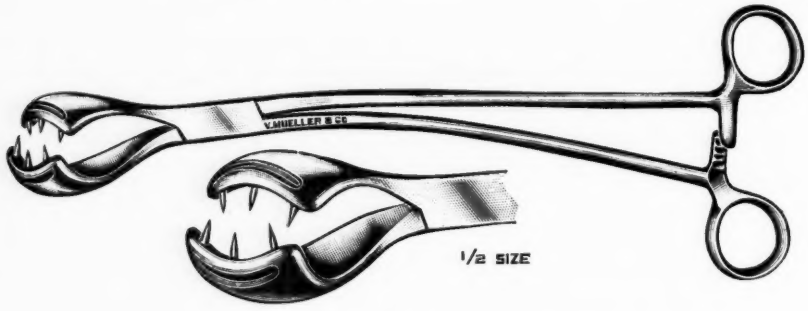

Fig. 1.

If a curettage is not performed prior to the contemplated hysterectomy, a Graves speculum is inserted and spread widely so as to permit entrance of the head of the delineator. The vagina then is swabbed with a suitable antiseptic and the application of the delineator proceeds as detailed above.

The handles of the instrument remain between the patient's thighs, naturally.

After the procedure for hysterectomy approaches the level of the cardinal ligaments, the steel head of the delineator can readily be palpated anteriorly and posteriorly. Where dense adhesions exist, a nurse can push up on the handles from below and even apply a slight rotary or side-to-side motion to assist in palpating the head. The technique I employ when the hysterectomy reaches the stage near the cervix makes palpation still easier. The anterior cervical fascia is transversely incised across the entire cervix and then dissected downward over the upper 1 cm. of vagina. With the finger, one can now easily palpate the end of the delineator, and one has the assurance that it is at the uppermost extent of the vagina. If the cardinal or paracervical ligaments are sufficiently freed from the cervix, one can now incise into the vagina by cutting through the anterior vaginal wall with a scalpel, using the groove on the anterior spoon of the delineator as a guide for the incision. Once the vaginal wall is incised, the delineator can be removed, or, if desired, similar dissection of the posterior cervix can be accomplished and the posterior fornix entered in the same manner. A nurse can then detach the instrument. This is best done by spreading the jaws widely and, to insure that the spines are free, the handles are moved through a 45 degree arc counterclockwise and then 45 degrees clockwise, from the vertical axis. Once detached, the delineator is pulled out of the vagina and the cervix can then be circumcised from the vaginal vault under direct vision.

I suppose the clamp could be retained on the cervix while the latter is circumcised from the vagina, and where the uterus is small the cervix and corpus could be pulled out vaginally, but this is not advised, nor intended in the use of the delineator.

REPORT OF A CASE OF MONOAMNIOTIC TWIN PREGNANCY

W. B. Crouch, M.D., Colorado Springs, Colo.

(From the Glockner-Penrose Hospital, Colorado Springs, Colo.)

THE incidence of cases of monoamniotic twin pregnancy appears to be somewhat debatable. After the excellent discussion of etiology by Charlton and associates,[1] further discussion seems redundant.

Case Report

Mrs. T. S. was a 42-year-old gravida vi, para v, whose last menstrual period was Jan. 15, 1949. The estimated date of confinement was Oct. 22, 1949. Her past history revealed only the usual childhood diseases and an appendectomy in 1928. All previous pregnancies had terminated in spontaneous deliveries of living full-term infants. When first seen on May 23, 1949, she had already gained 25 pounds and the blood pressure was 158/98. She was placed on a salt-free diet and the blood pressure came down to 120/60 and the weight gain in the following 5 weeks was only 2¼ pounds. The remainder of the antepartum course was uneventful until 5 weeks prior to term, when she again developed a mild hypertension with slight edema of the feet. There was no albuminuria.

On Oct. 1, 1949, the patient reported that she had not felt life for the last 24 hours. During the preceding 2 weeks she had lost 3¼ pounds and the blood pressure had come down from 146/80 to 130/76. She was seen in the office on Oct. 6, 1949, at which time no fetal heart tones were heard. Rectal examination revealed the presenting part at Station O, and the cervix effaced and 2 cm. dilated. The position of the fetus not noted; twins had not been diagnosed. At 3:00 P.M. on the same day, the patient went into labor spontaneously. Good progress was made, the membranes rupturing spontaneously at complete dilatation. Twin A was delivered spontaneously, a stillborn female in vertex presentation. The vertex of Twin B descended rapidly and she was delivered spontaneously, stillborn, 7 minutes later. Placenta and membranes were delivered intact by a modified Credé maneuver with minimal hemorrhage. The placenta was a single large one. The cords were separated at their attachments by an interval of 2 cm. The cords were much twisted and knotted, beginning almost immediately above the attachments and extending for a distance of 18 cm. from the placenta. There was no evidence of septal remnants or other indication of a partition. Blood vessels anastomosed freely across both sides of the placenta.

Summary

A case of monoamniotic twin pregnancy with twins stillborn from knotting and twisting of the cords has been presented.

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TWO CYSTIC HEMANGIOMAS IN A MYOMATOUS UTERUS

DOBRIVOJE S. LUKIĆ, M.D., BELGRADE, YUGOSLAVIA

(From the Clinical Hospital for Gynecology and Obstetrics, High Medical School, Belgrade)

GYNECOLOGIC operations enable us to learn about a large number of benign tumors of the uterus, of varied morphological structure and at different stages of their evolution. Some of the rare tumors of the uterus have an exceptional significance in medical literature, due to their etiology, location, and histogenesis. Among this group of rare but interesting tumors of the uterus is the hemangioma.

Robert Meyer[1] has given us the best description of the gross and microscopic structure of the uterine hemangioma. Analyzing the already published cases, Meyer characterizes the uterine hemangiomas as genuine independent tumors of the blood vessels. He distinguishes between the pure tumors of the uterine wall itself and the angiomas encapsulated in myomas. The latter are mixed tumors, consisting of angiomatous growth so mingled with myomatous, fibromatous, or sarcomatous structures that they cannot be pathologically or histologically separated.

Malpas and Brundet[4] have found that not more than 12 cases of primary hemangiomas of the uterus were described in the world literature up to 1952. To this rare collection of hemangiomas we are adding our case of two cystic primary hemangiomas which developed subserously in a myomatous uterus.

Case Report

A. M., a farmer's wife, aged 45 years, was admitted to our clinic on May 26, 1950, and gave the following history. Menstruation began at the age of 18 years. The periods lasted seven to eight days with a 30 day cycle and an abundant but painless flow of blood. The last normal menstruation occurred in March, 1950, and was very scant. She had had six pregnancies including one twin pregnancy and one induced abortion. In November, 1949, she noticed that something was growing on both sides of the lower abdomen which disturbed her during her work. Ten days before coming to the clinic she had felt pains in the lower part of the abdomen and in the lumbar region, and had fainted. A fever developed.

The patient upon admission appeared well developed but poorly nourished. The skin and mucous membranes were pale. The pulse rate was 120, regular but weak. The temperature was 100.1° F. and the blood pressure 100/75. The urinalysis was normal except for rare, fresh blood cells and many bacteria. The blood examination showed a hemoglobin of 44 per cent red blood count of 3 million and white blood count of 15,000.

The external genitals, vagina, and cervix were normal. The uterus could not be palpated with certainty but seemed to be in mid-position, enlarged and of firm consistency, immobile and moderately sensitive.

A diagnosis of bilateral ovarian cyst was made and an exploratory laparotomy performed after the routine preparation of the patient. At operation the pelvic and abdominal

cavity was found to contain two tumors. One of these tumors, round in shape, cystic, and the size of a young child's head, arose from the posterior wall of the fundus uteri. The whole surface of this tumor was firmly adherent to the parietal peritoneum, small bowel, and to the large bowel in the region of the colon and hepatic flexure. From the right anterior wall of the fundus uteri there arose another round-shaped, cystic tumor, the size of a newborn baby's head. The whole surface of this second tumor was covered with adhesions which extended to the small bowel, the other tumor, and the peritoneum. The right ovary was cystic. Both the tumors were enucleated, after which a subtotal hysterectomy with a bilateral salpingo-oophorectomy was performed.

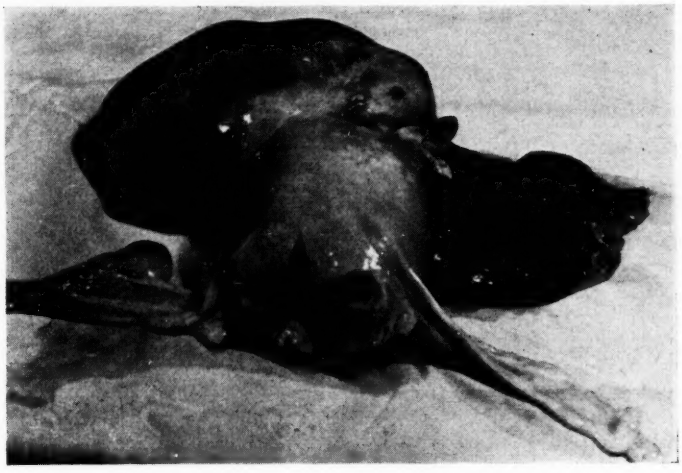

Fig. 1.—Gross specimen showing uterine fundus with attached adnexa and two hemangiomas.

Macroscopic Aspect of the Specimen (Fig. 1).—When the specimen removed at operation was examined there was noted a circumscribed tumor, the size of a goose egg, in the fundus which on section revealed a myomatous structure. A cystic, subserous tumor with a smooth surface, the size of a newborn baby's head, was attached to the uterus by a short pedicle. The wall of the cyst, which contained blood of a dark color, was only 2 mm. thick. At the same level as the first tumor, but on the left posterior side of the fundus, a second cystic subserous tumor was present. On cross section this tumor was found to have a wall 1.0 cm. thick and also contained dark blood. The uterine cavity was of average size and the endometrium appeared normal. The right ovary was cystic, but the left adnexa were normal.

Microscopic Description.—The wall of the tumor consisted of loose tissue composed mostly of blood vessels and loose mesenchyme. A large number of these blood vessels were of the capillary type, but in addition to these there were also more dilated blood vessels with thin walls, likewise containing blood. The venous type of blood vessel was encountered comparatively infrequently. The mesenchymal connective tissue was composed of branching cells and in many places showed a structure of more or less numerous collagenous fibrils. The cell nuclei were of varying size. In certain areas the blood cavities formed real sinuses, which were lined with endothelial cells. The uterine muscle tissues could not be demonstrated with certainty. Remnants of the musculature were found chiefly at the edges of the tumor, but here also there was an infiltration by the previously mentioned vascular structures (Figs. 2, 3 and 4).

The wall of the intact cystic tumor was composed of the same tissue as described in the other tumor. Nevertheless, its structure was somewhat distorted, due to the fact that the tissue was compressed under the pressure of the cystic content.

Fig. 2.

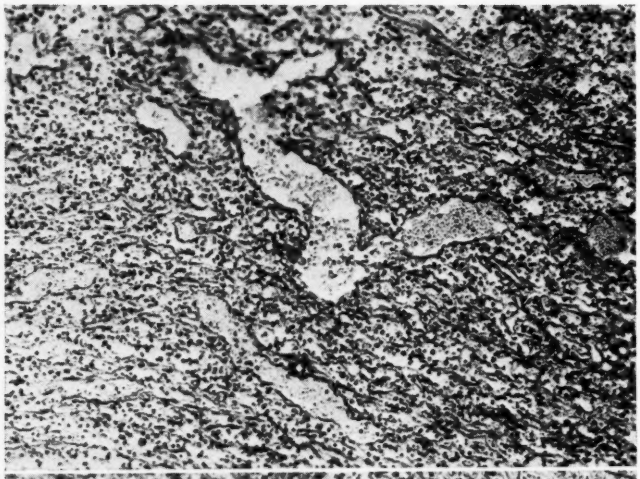

Fig. 3.

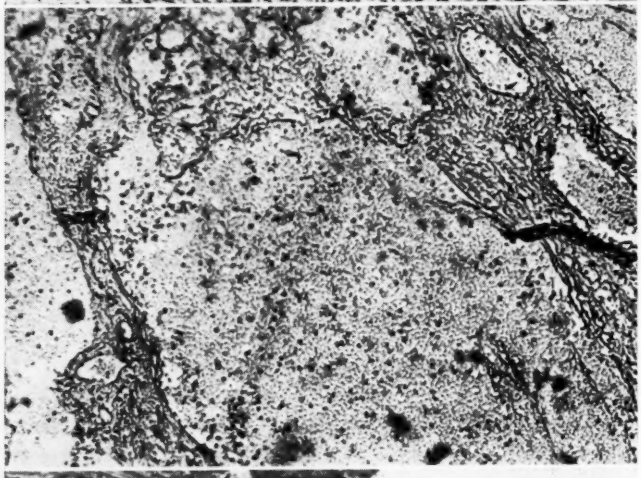

Fig. 4.

Fig. 2.—Photomicrograph of hemangioma showing vessels of a capillary type.
Fig. 3.—Photomicrograph of hemangioma showing sinuses lined by endothelium.
Fig. 4.—Wall of the cystic portions of the hemangiomas.

The pathological diagnosis was therefore two cystic hemangiomas of the fundus uteri (hemangioma capillare, pt. cavernosum).

Comment

The subserous location of both the cystic hemangiomas and their histological structure are characteristic of true primary hemangiomas of the uterus. The occurrence of two such cystic tumors of this size and location appears to be a unique observation.

According to the theoretical premise offered by R. Meyer, true histogenetic angiomas are the most mature form of benign endothelioma, as distinguished from the immature form of malignant endotheliomas. The blood vessels in hemangiomas are of endothelial origin, but it is necessary to distinguish between the degree of maturity and the degree of differentiation of these embryonal cells (Meyer[1]).

The congenital origin of real hemangiomas has been recently confirmed by Anderson,[6] Saltykow,[5] and others. The hemangiomas are created by the proliferation of the endothelial tissue, the solid branches of which are then transformed into canaliculi and connected with a regular blood vessel through afferent and efferent vessels (Anderson[6]). Saltykow[5] considers that there is an etiological relationship between the development of hemangiomas and certain disturbances in the embryological evolution of the organ in which hemangiomas are formed. Hemangiomas are most often composed of capillaries and less often of veins and arteries.

The clinical diagnosis of uterine hemangioma is extremely difficult. No particular points in the history are typical of this condition. The gynecological findings and the usual laboratory tests also provide us with no possibility of making the diagnosis. The reason is of course that the clinical signs of the hemangioma are similar to those produced by other similar pathological changes in the uterus.

The uterine hemangioma occurs most often among women in the years of reproductive activity and especially among those who have given birth to children. The tumor has, however, also been observed in the menopause (H. Hirschberg[3]).

Two techniques have been applied in the therapy of uterine hemangiomas, surgery and x-radiation: (1) The operative method, i.e., hysterectomy, may be applied with or without the conservation of the adnexa. In our case, a subtotal hysterectomy with bilateral salpingo-oophorectomy was performed because of the age of our patient and because the right ovary was cystic. (2) X-ray therapy seems to be indicated as supplementary therapy in certain rare types of polypoid uterine hemangiomas on account of their tendency to recurrence (Malpas and Brundet[4]). The favorable response of the recurrences to x-ray therapy, as described in the cases reported by Kevorkian[8] and Knoll,[9] indicates the radiosensitivity of this particular type. The usual forms of primary uterine hemangiomas described in the literature have shown no tendency to recur after complete removal surgically.

The histological examination of both the described cystic tumors was carried out on Oct. 11, 1950 (No. 3889), in the Histopathological Institute, Zurich University, by Prof. Dr. A. Albertini to whom I wish to express my gratitude.

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DELAYED DELIVERY OF A FETUS PAPYRACEOUS TWIN

JOHN A. KERNER, M.D., F.A.C.S., SAN FRANCISCO, CALIF.

(From the Department of Obstetrics, Mount Zion Hospital)

THIS is an unusual instance in which a fetus papyraceous was delivered three days after a living twin and in which the placenta of the fetus papyraceous was delivered fourteen days after the fetus.

It has long been recognized that one or more members of multiple pregnancies may be blighted before the seventh month while the other member or members may go on to or near to term. The blighted fetus may be physically affected in many ways. It may be well preserved, macerated, or mummified. Kindred points out that most are flattened, but that only a few more than one-fourth are mummified. It is generally felt that death is due to the fact that one twin is deprived of its circulation either by reason of a cord complication or because the more powerful member has secured a relative monopoly of the blood supply.

The blighted fetus usually is delivered immediately after the more normal member, though at times the blighted fetus may precede the normal baby by hours, days, or even weeks.

Case Report

The mother was a 37-year-old, white primigravida whose expected date of confinement was Aug. 8, 1953. The delivery took place July 4, 1953. The patient was first seen in the twenty-fourth week of pregnancy. Just before her pregnancy, she had hepatitis. Early in pregnancy, the abdomen seemed unusually distended. During the pregnancy (the patient had been in Hong Kong), nausea and vomiting were very severe, especially in the first five months. At the time the patient was first seen (i.e., in the twenty-fourth week), the uterus was distended less than one would expect for a pregnancy of that duration. The baby was in vertex presentation. The mother was in relatively good condition. The membranes ruptured in the thirty-third week. Labor followed spontaneously about a week later.

Delivery was simple. The baby weighed 4 pounds, 15 ounces and was in excellent condition. The placenta separated spontaneously and delivered easily. It was a small circumvallate placenta. There was minimal blood loss during and after the delivery. The uterus contracted well.

On the third postpartum day, the patient spontaneously passed a fetus papyraceous. There was no significant bleeding. The placenta did not pass. Examination under anesthesia revealed a very thin, densely adherent placenta in the region of the left cornu. There was no free edge. In view of the facts that the placenta would not separate with ease, that there was no significant bleeding, and that the placenta was obviously not large, it was decided to leave the placenta. The patient was given aureomycin, and placed under observation. Oxytocics were used for three days without effect. At no time did she have significant bleeding; in fact, blood loss was less than usual after a normal delivery. The patient was discharged on the ninth postpartum day. On the seventeenth postpartum day, she passed a flat mass approximately 7 cm. in diameter and about 1 cm. thick. Sections of this mass proved it to be a degenerated placenta. There was no significant bleeding.

The fetus was of the flattened or papyraceous type. The degree of flattening and distortion was remarkable, especially with regard to the head. The facial features were obliterated. The arms were bent and folded under the head. The lower extremities were extended and twisted, becoming adherent to each other. The skin felt tough and leathery. The convex surface was slightly shaggy as if it had been closely adherent to the uterine wall. The whole surface of the body was grayish in color. There was no bloating or swelling. The epidermis seemed to be drawn down on the underlying bones which in turn were compressed. There was remarkably little shredding of the skin. Sections of the anterior abdominal wall showed complete autolysis and lack of cellular detail, but the general outline of skin, muscle bundles, and cartilage was preserved. Sections of the placenta revealed all the cells to be degenerated. There could be distinguished some ghosts of chorionic villi. The cord, though very small, was tough, elastic, and uniform.

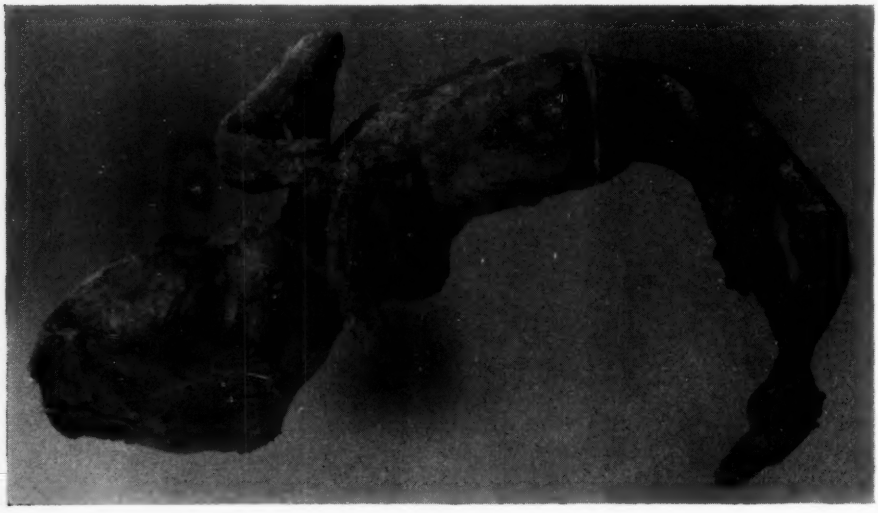

Fig. 1.

Fetus papyraceous is always unusual, but the delayed delivery of the fetus and placenta in this case made it of considerable interest. The decision to leave the placenta in utero was controversial but it was believed that operative removal of this obviously atrophic, densely adherent structure might be associated with dangerous trauma to the uterus. This was especially true because the placenta was in an inaccessible area of the three day postpartum uterus.

It was my conclusion that the complete necrosis of the placenta probably had its inception in maternal conditions which caused necrosis of the chorionic epithelium and this prevented nutrition of the fetus.

It was gratifying that conservative therapy was followed by satisfactory results, namely, the uncomplicated spontaneous delivery of the placenta of the fetus papyraceous some seventeen days after the delivery of a normal child.

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RETAINED ABDOMINAL PREGNANCY*

Report of a Case

RICHARD A. GILMAN, M.D.,** MORTON SCHWARTZ, M.D.,**
HENRY STEPHENSON, M.D.,*** AND JANET SETTLE, M.D.,
TACOMA, WASH.

(From Tacoma Indian Hospital)

ABDOMINAL pregnancy, while not rare, is considered to be one of the more unusual complications of pregnancy. Many cases have been reported, and much literature has accumulated on this interesting subject. Nevertheless, most cases of abdominal pregnancy are unusual enough from an individual standpoint to justify their being reported.

We are submitting the following case because this patient had a laparotomy for an abdominal mass four years previously with a diagnosis of a retroperitoneal tumor made postoperatively.

Case Report

The patient was a 45-year-old Alaskan Eskimo woman who spoke no English. She was first seen in Alaska in January, 1949, with a lower abdominal mass which was believed to be a fibroid uterus. The patient refused surgery and returned home. Six months later she agreed to surgery. At that time, the entire left side of the abdomen and pelvis was filled with an irregular mass. Exploratory laparotomy was performed and a diagnosis of a retroperitoneal tumor was made. No attempt was made to remove or biopsy the tumor. The patient was followed up, and it was felt that the mass had become smaller. Because of the decrease in size, on April 15, 1953, the patient was transferred to the Tacoma Indian Hospital for further study.

On admission there was noted a 45-year-old Eskimo woman who did not appear ill. On physical examination, a mass about 12 cm. in diameter was felt rising out of the pelvis and extending upward filling the entire left side of the abdomen. The uterus could not be made out on pelvic examination, nor could it be determined if the mass arose from the uterus or adnexa. A flat plate of the abdomen revealed the presence of fetal parts. It was noted that the long bones including the epiphyses were completely calcified. An Aschheim-Zondek test was negative and no signs of pregnancy could be made out. The cervix was firm and no fetal heartbeat was heard. From the findings and the length of the history, we believed we were dealing with a retained abdominal pregnancy.

On May 7, 1953, one of us (R. A. G.) performed an exploratory operation. A fetus about the size of a full-term pregnancy was found, surrounded completely by thickened membranes. Numerous loops of small and large bowel were adherent to it. The uterus, right tube, and right and left ovary could be identified. The left tube could not be identified and the blood supply of the fetus appeared to be coming from the left adnexa. Adhesions were also present between the fundus of the uterus and the membranes of the fetus. No structure which could be interpreted as a placenta could be found. The mass

*The opinions expressed are those of the authors and do not necessarily reflect those of the United States Public Health Service or the Office of Indian Affairs.

**Senior Assistant Surgeon, United States Public Health Service (Reserve).

***Assistant Surgeon, United States Public Health Service (Reserve).

Fig. 2.

Fig. 1.

Fig. 1.—Shows uterus, adnexa, and attached mass containing fetus.
Fig. 2.—Shows partially mummified and calcified fetus.

was freed until it was attached only to the uterus and left adnexa. Considerable bleeding was encountered at this point. It was then decided to remove the pelvic organs and fetus together. A total hysterectomy and bilateral salpingo-oophorectomy was performed, removing the fetus and genital organs en bloc. The bleeding was controlled by ligating the ovarian and uterine arteries.

The postoperative course was uneventful. The patient was ambulated on the third postoperative day. She returned to her home in Alaska, and a letter received from her three months after the date of the operation stated that she felt well and was performing her normal activities.

The pathologic specimen revealed the uterus, tubes, and ovaries as described previously with the attached encapsulated mass 18 cm. in diameter. Within the lumen of the mass, the fetus was partially calcified and mummified with some autolysis of the cutaneous and subcutaneous tissues. The fetus weighed 3 pounds, 1 ounce and showed no obvious major anomalies. The umbilical cord was wound twice around the neck.

Comment

In 316 cases of abdominal pregnancy reviewed by Burleson and Bragg,[2] there were only 158 live births, representing a mortality rate of 50 per cent. Deming[3] states that 22 per cent of abdominal gestations which progressed to the sixth month resulted in a dead fetus. A large proportion of infants that survive an abdominal pregnancy show congenital abnormalities. Of those that are essentially normal, there are many premature infants.

The cases in which the fetal death is neither commensurate with, nor soon followed by, surgical intervention yield some of the most interesting phenomena of obstetric and gynecologic medicine. The entire product of conception may resorb and leave no trace of its existence, an outcome which is most likely when fetal death occurs early in pregnancy. The dead fetus sometimes becomes infected, and suppuration ensues with frequent sinus or fistula formation. The fetus can mummify and remain as a shrunken image of its earlier state. The adipocere is formed when the fetus undergoes fatty degeneration, and the soft tissue becomes an amorphous greasy substance. This is perhaps the rarest fetal fate encountered. The lithopedion, which is widely known but seldom seen, occurs in 1.5 per cent to 1.8 per cent of abdominal pregnancies.[5] Kuechenmeister has classified lithopedions into three varieties: *lithokelyphos* (stone sheath) in which the fetal membranes only are calcified, *lithokelyphopedion* (stone sheath child) where both the fetus and its surrounding membranes show calcium deposits, and *lithopedion* (stone child) wherein the fetus only has extraskeletal deposits of calcium salts.[1, 4]

As long as the pregnancy continues, the mother is exposed to the possibility of sudden and acute hemorrhage. With the death of the fetus and the subsequent atrophy of the placenta, the incidence of this complication is markedly decreased but not completely gone. Once the fetus has undergone degenerative changes, the only difficulty that the mother may experience is the pressure effect which may be noted with any intra-abdominal tumor. Other more serious complications can ensue, however. Sepsis due to secondary infection of the abdominal pregnancy is a frequent occurrence. Erosion of the fetal bones into the rectum may occur as reported by Gustaveson.[8] Cullin[8] reported a case wherein erosion of the fetal bones occurred into the bladder and cecum. Others re-

port the erosion of fetal remnants through the anterior abdominal wall,[8] the anterior fornix of the vagina,[6] and into the stomach.[8] In the latter case there was emesis of the fetal fragments. Intestinal obstruction by pressure and adhesions can occur. The over-all maternal mortality from abdominal pregnancy is decreasing from 35 per cent in a series[7] reviewed up to 1919 to the still formidable figure of 15 per cent in a series of cases reviewed as recently as 1952.[9]

The treatment may be divided into two parts, the management of the fetus and of the placenta. The greatest opportunity of obtaining a living child is after the thirty-eighth week. Therefore, if the fetus is still alive and within four weeks of this time, a period of expectant waiting may be undertaken provided that certain criteria are met. These are that the mother must be hospitalized and preparations made for immediate laparotomy and blood replacement should hemorrhage ensue. If these conditions cannot be fulfilled, laparotomy should be performed at once. If the mother presents herself with the child dead, and it was known to have been alive recently, one may wait a period not exceeding four to six weeks to allow the placenta to atrophy, since there is no line of demarcation of the functioning placenta implanted outside the uterine cavity.

The management of the placenta has gone through two main stages, first, marsupialization and, second, allowing the placenta to remain in situ. Marsupialization was undertaken to allow ready accessability if hemorrhage ensued and to prevent infection. However, it was more often accompanied by these complications. Beck pointed out that if the placenta was left in situ, it would most probably resorb. This has been the most accepted method of management. Occasionally infection of the placenta takes place but if it is not handled or traumatized hemorrhage will not occur. Today, with the improvement in antibiotic therapy, infection plays a lesser role.

Because of the complications which may result from a retained abdominal pregnancy, we feel that they should all be removed. With the advent of modern surgery, improved anesthesia, fluid replacement, and antibiotics, we can see no reason for allowing an abdominal pregnancy to remain in the peritoneal cavity.

Summary

A case of abdominal pregnancy retained at least four years is reported. This had previously been diagnosed at laparotomy as a retroperitoneal tumor. The complete removal of the fetus and pelvic organs was performed. The complications affecting the mother and fetus are discussed. The treatment has been reviewed.

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BLADDER AVULSION AS A COMPLICATION OF EXTRAPERITONEAL CESAREAN SECTION

A Case Report

EDUARD EICHNER, M.D., F.A.C.S., ARTHUR ROTH, M.D., F.A.C.S.,
HYATT REITMAN, M.D., AND KALMAN KUNIN, M.D.,
CLEVELAND, OHIO

(From the Division of Obstetrics and Gynecology and the Department of Urology, Mount Sinai Hospital, Cleveland)

MRS. R. A., a 34-year-old primigravida, was admitted to Mount Sinai Hospital (No. AD 2536) in early active labor on March 11, 1950. The last menstrual period had begun on May 27, 1949. Painful contractions had started six hours preceding her admission at 7 A.M. at which time the bag of waters was intact, the fetus in occiput right anterior presentation with the vertex floating. Contractions occurred at three-minute intervals and lasted 30 to 45 seconds. Several small subserous fibromyomas ranging up to 3 cm. in size were palpated on the anterior uterine wall. The cervix was thick, posterior, and admitted only a fingertip. Blood pressure, pulse, temperature, and fetal heart tones were normal. Analgesia was started at 1 P.M., and during the next twenty-four hours she received a total of Seconal, 600 mg., Demerol, 300 mg., and morphine sulfate, 30 mg. She was given 2,000 ml. 5 per cent glucose in water during the night when acetonuria and a slight temperature elevation were noted. Penicillin was started.

Roentgen pelvimetry was done on the morning of the twelfth, and disclosed an adequate pelvis with no apparent abnormalities. The placenta was high and anterior, the fetus engaged in left occiput posterior. When progress failed, consultation was held at 3:30 P.M. on March 12 and the report was asynclitic posterior vertex, station O (presenting part at the spines), cervix 7 cm. dilated, membranes probably ruptured. Maternal pulse 120, fetal heart tones 180, satisfactory. The impression was: adequate pelvis with uterine inertia secondary to uterine myomas and fetal malpresentation. Rest, fluids, and morphine were recommended, and a check examination including sterile vaginal was to be done after a period of adequate rest. Extraperitoneal section was to be done if progress were not satisfactory.

Mild but irregular contractions recurred at 11 P.M. on March 12. Additional fluids were given during the night. There was no further progress. Through a series of unusual mishaps the section was not started until 3 P.M. on March 13, 1950. A living male infant that weighed 3,830 grams was delivered by Norton extraperitoneal section. Difficulty was encountered with the delivery of the fetal head, impacted in the maternal pelvis. After delivery it was noted that the bladder and part of the urethra had been completely avulsed from the symphysis and the remainder of the urethra, and the vagina had been separated from the cervix. The uterocervical incision was repaired in a routine fashion, and the senior obstetrician (E. E.) notified.

Figs. 1 and 2 are self-explanatory, and demonstrate the condition at that time. The location of the left ureter was identified, and verified by temporary ureteral catheterization. The right ureter was never seen. The vagina was replaced, and sutured to the cervix. The urethrourethral anastomosis was done over the catheter originally introduced for bladder identification. The bladder rent was closed with a suprapubic Foley catheter

in place. A Penrose drain was placed in the space of Retzius, and shock was treated routinely. On the following day both catheters were draining improperly. Since the right ureter had not been identified at operation, and since irrigating fluid was not completely recovered, the incision was reopened and the bladder and extravesical space investigated (A. R.). Again, the right ureter could not be located. It was noted that the urethral catheter had pushed through the lateral bladder wound and was lying in the left paravesical space. This catheter was replaced by a Foley catheter, and the repair again completed (Fig. 3).

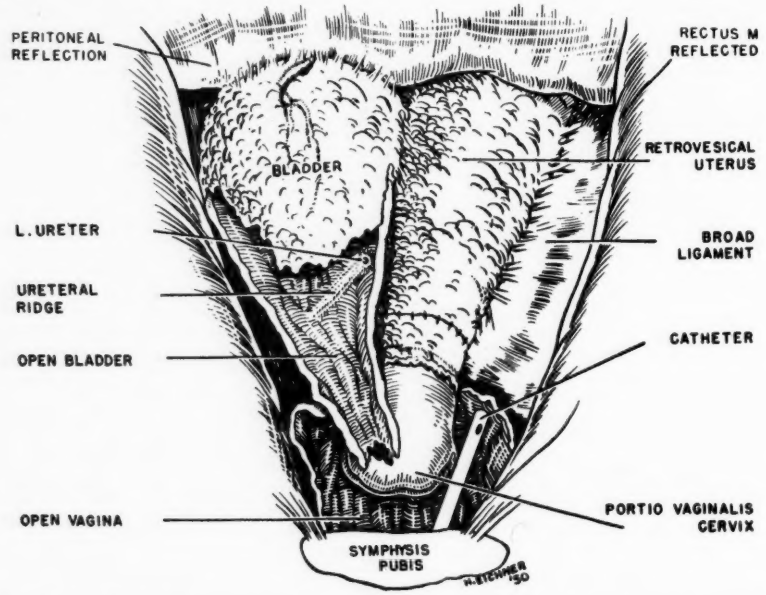


Fig. 1.—The retropubic space as it appeared after the cesarean section. The cervical incision has been repaired. The open bladder lay free in the space, pulled high to the right by the still intact peritoneum. The left ureter and ureteral ridge are seen. The urethral catheter tip is free, lying on the open posterior portion of the torn vagina. The anterior vaginal wall is not apparent, and there is only a very short posterior segment still attached to the cervix.

Intravenous pyelograms on March 31 demonstrated a mild bilateral hydronephrosis with narrowing of the right ureter and questionable stenosis. The report concluded: "It cannot be stated with certainty that the ureters enter the bladder bilaterally." Convalescence continued slowly, and eventuated in a small vesicocervicovaginal fistula. Attempt at transvesical closure was unsuccessful, but the ureter was identified at that time as entering the bladder in a slightly abnormal location. The patient was discharged on the seventy-eighth hospital day. A small fistula was still present seven months later, but could not be seen on cystoscopic examination. Intravenous indigo carmine and dye injected directly into the bladder appeared in the vagina at the identical spot. The consulting urologists believed this was a vesicovaginal rather than ureterovesicovaginal fistula. Shortly thereafter all leakage stopped, and the patient had adequate though not complete vesicle control.

Contrary to advice, she became pregnant. After intradepartmental consultation, a therapeutic abortion and sterilization were done (No. 1129) by fundal hysterectomy on May 16, 1951. At this time incontinence had redeveloped, and there was a moderately severe Proteus cystitis. The patient was discharged on the eighth postoperative day, again fully continent. There has been no radical change in her condition during the intervening years. She still has incomplete control, but this is ample for all times except when severe cystitis is present. She does not dribble during the day, but occasionally is damp during the night.

Fig. 2.—Schematic sagittal view of relationships demonstrated in Fig. 1.

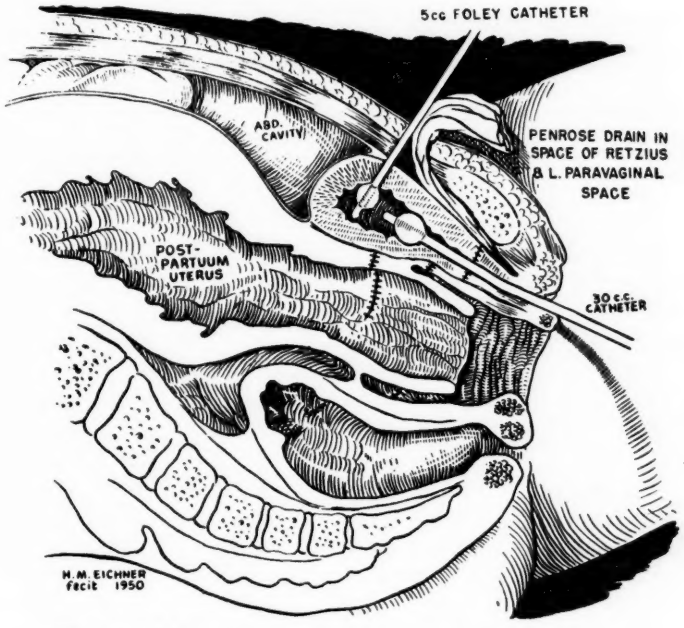


Fig. 3.—Schematic sagittal view of completed repair.

Summary

A patient with the unusual complication of complete avulsion of the bladder after a Norton extraperitoneal cesarean section is reported. Immediate repair did not hold, and was repeated on the day after delivery. Transvesical repair of the resultant fistula failed, and the fistula eventually closed spontaneously. Fundal hysterectomy for therapeutic abortion and sterilization was done one year later, early in the next pregnancy. The patient now has adequate but not complete control of the bladder.

Department of Reviews and Abstracts

EDITED BY LOUIS M. HELLMAN, M.D., BROOKLYN, N. Y.

Selected Abstracts

The Journal of Clinical Endocrinology and Metabolism

Vol. 14, No. 4, April, 1954.

Bongiovanni, A. M., Eberlein, W. R., and Cara, J.: Metabolism of Adrenal Steroids in Adrenogenital Syndrome, p. 409.

Goldberg, M. B.: Long-Term Cortisone Therapy in Congenital Adrenocortical Hyperplasia: Report of 4 Cases, p. 389.

Cortisone has been found very satisfactory in the treatment of congenital adrenocortical hyperplasia. The author reports four cases of this abnormality so treated. The reason for the report is to assay the effects of long-term administration of cortisone in congenital adrenocortical hyperplasia. Fifty to seventy-five milligrams of cortisone in divided doses proved sufficient to produce the desired results. Administration for as long as eighteen months provided no reduction in corticotropic activity after cortisone therapy was stopped. Since cortisone therapy in this condition must be considered substitution therapy, partial adrenalectomy may be a procedure to be considered in further cases.

Psychosis developed in one patient and a duodenal ulcer in another. These complications disappeared after cessation of cortisone administration.

There was some asthenia following sudden cessation of cortisone administration and it may be advisable to give corticotropin for a short time prior to discontinuation of the cortisone.

J. EDWARD HALL, M.D.

Vol. 14, No. 5, May, 1954.

Tokuyama, I., Leach, R. B., Sheinfeld, S., and Maddock, W. O.: Depression of Gonadotropic Excretion as a Method for Assay of Estrogens in the Human Subject, p. 509.

Perkoff, G. T., Salhanick, H. A., Zarrow, M. X., Nelson, D. H., and Tyler, F. H.: Effects of Administration of Relaxin to Human Subjects, p. 531.

Goodland, R. L., Reynolds, J. G., and Pommerenke, W. T.: Alveolar Carbon Dioxide Tension Levels During Pregnancy and Early Puerperium, p. 522.

The alveolar carbon dioxide tension has a cyclic variation in the menstrual cycle that corresponds to the levels of progesterone. Thus, during the luteal phase, there is lower alveolar carbon dioxide tension than during the follicular phase. Forbes has shown that plasma progesterone levels vary during pregnancy with peaks at average intervals of four weeks. This article reports on the results of the study of alveolar carbon dioxide tension in pregnant women. Alveolar carbon dioxide tension is decreased during pregnancy. There were fluctuations in its level, however, that corresponded to those in the nonpregnant woman. Shortly after delivery, the alveolar carbon dioxide tension shows a pronounced elevation.

J. EDWARD HALL, M.D.

Vol. 14, No. 6, June 1954.

Kitay, J. I.: Pineal Lesions and Precocious Puberty: A Review, p. 622.

Zarrow, M. X., Shoger, R. L., and Lazo-Wasem, E. A.: Rate of Disappearance of Exogenous Progesterone From the Blood, p. 645.

Franksson, C., Gemzell, C. A., and von Euler, U. S.: Cortical and Medullary Adrenal Activity in Surgical and Allied Conditions, p. 608.

An increased activity of the pituitary-adrenocortical system has been repeatedly demonstrated as part of the reaction pattern of the organism to stressful situations. The response of the adrenal medulla and the adrenergic nervous system to stress is, however, less clearly defined.

Twenty-seven surgical patients who had suffered traumatic injury and were operated upon were followed with daily determinations of blood and urine. The levels of 17-hydroxycorticosteroids in the blood were determined as well as the amount of epinephrine and norepinephrine in the urine. Eosinophil counts were done.

Surgical operation causes an increased activity of the adrenal cortex which releases an increased amount of adrenocortical steroids. These steroids remain high for about thirty-eight hours. During operative or postoperative shock the blood level of 17-hydroxycorticosteroids increases and remains high as long as the shock lasts.

In cases in which the postoperative increase of 17-hydroxycorticosteroids fails to materialize, an insufficiency of the pituitary-adrenocortical system would be suggested. Substitution therapy with cortisone or ACTH may be appropriate.

In patients with injuries or surgical operations accompanied by complications, the excretion of epinephrine or norepinephrine, or both, was often greatly increased during the period immediately after the trauma.

J. Edward Hall, M.D.

The Canadian Medical Association Journal

Vol. 70, No. 5, May, 1954.

Straker, M.: Psychological Factors During Pregnancy and Childbirth, p. 510.

Pregnancy and childbirth represent an important milestone in the life of every woman and may produce varying reactions. The reactions of the expectant mother depend on many factors. The postpartum psychosis is the result of the emotional trauma of pregnancy, labor, and delivery in an already unstable personality.

Anxiety is the most important emotional factor in pregnancy. The emotionally unstable woman will need special attention because of her fears and anxieties.

The central fear in childbirth is the fear of death. This and other fears should be recognized and treated.

Emotional preparation for pregnancy and delivery is the most important phase of a satisfactory mental attitude to the process.

The commonest diagnosis in a group of 13 patients with psychiatric problems during pregnancy and the postpartum period was anxiety hysteria. All the labors were uncomplicated. In most the labors were short, easy, and accompanied by a reaction of calm, cooperation, and pleasure.

Attention to the psychological reactions of the obstetrical patient will give important clues to indicate what special exploration and care are required for this or that individual.

J. Edward Hall, M.D.

Irwin, R. W.: Carcinoma of the Cervical Stump, p. 561.

Carcinoma of the uterus is second only to carcinoma of the breast as a cause of cancer deaths in females. At the Manitoba Cancer Institute in the years from 1944 to 1952, carcinoma of the cervix was responsible for 6.8 per cent of all female cancer deaths and for 1.05 per cent of female deaths from all causes in the province.

Total hysterectomy would prevent carcinoma of the cervical stump in those cases in which it was not present at the time of operation and probably cure some of the early cases.

In the Winnipeg General Hospital from December, 1947, to March, 1953, 516 abdominal hysterectomies were performed. Of these, 285 were total and 231 subtotal. No fatalities resulted from the subtotal and only one from the total hysterectomies, and this was not related to the type of procedure.

During the period from May, 1944, to December, 1951, in this same hospital, 21 cases of epidermoid carcinoma of the cervical stump were recorded. These represented 5 per cent of all the recorded cases of carcinoma of the cervix.

The arguments advanced for subtotal hysterectomy are not very sound. Moreover, subtotal hysterectomy may give the woman a false sense of security. There was a delay of 9 months from the onset of symptoms to consultation. This is four months longer than among all cases of carcinoma of the cervix.

The symptoms are the same. The grading had little relation to the survival time, but staging was of utmost prognostic importance. No patient in this series with Stage I carcinoma died. The survival time was a little less in those who had subtotal hysterectomy than in the larger group. Many factors may account for this result.

J. EDWARD HALL, M.D.

Vol. 70, No. 6, June, 1954.

Mathewson, F. A. L.: Hazards in the Use of Antibiotics, p. 632.

Journal of Pediatrics

Vol. 44, No. 4, April, 1954.

Editor's Column, Oxygen and Retrolental Fibroplasia, p. 448.

A short, informative summary of the present status of the relationship of oxygen and retrolental fibroplasia.

SCHUYLER G. KOHL, M.D.

Irish Journal of Medical Science

February, 1954, 6th Series, No. 338.

McCormick, Victor O.: The Relief of Pain, p. 78.
Gray, T. C. (Liverpool): Recent Techniques in Anaesthesia, p. 87.

Browne, Allan D. H.: A Review of the Relief of Pain in Obstetrics, p. 90.

A cursory historical presentation which is full of humor and provides more laughs than information.

SCHUYLER G. KOHL, M.D.

March, 1954, 6th Series, No. 339.

Bowlby, John: The Effect of Separation From the Mother in Early Life, p. 121.

The Dublin Maternity Reports, 1952, p. 106.

A most interesting and sometimes searching critique on the obstetrical results in Dublin's hospitals for the year 1952. The discussants are the leaders in Irish obstetrics. The reflection of their philosophy of life and obstetrics is most refreshing and worth while. One discussant reports on 70 symphysiotomies.

SCHUYLER G. KOHL, M.D.

Geburtshilfe und Frauenheilkunde

Vol. 139 No. 11, November, 1953.

Puder, H., and Wolf, G.: Diagnosis of the Stage of the Menstrual Cycle by Examination of the Cervical Mucus and the Histological Study of the Cervical Glands, p. 995.

Many procedures, including the cytological smears of Papanicolaou, the basal temperature technique, and others, are available for the study of the hormonal changes occurring in women, not only with the menstrual cycle, but also in the menopause. The earliest means of studying these changes was described in 1847 by von Pouchet, who utilized the color and consistency changes of the cervical mucus. Modifications of this method have been made. The technique of studying these changes is simple, consisting only of removal by suction of a small amount of mucus from the cervical canal, and, after spreading it on a slide, allowing it to dry at room temperature. The author has described his results in the observation of 155 cases which he followed by this type of study. When the mucus dries on the slide, three types of crystal and pattern formations are noted: Grade I, small thin crystals arranged in a thin, loose pattern; Grade II, larger crystals arranged in a fernlike formation with crystallization developing in thin leaves from a central stalk; and Grade III, large, plump, swollen crystals which take the form of a distended fern leaf. The author finds that although certain patterns are more predominant on a statistical basis, during various phases of the menstrual cycle, this method cannot be used as a definite diagnostic procedure to determine ovulation. Similarly, all types of fern formation were noted in smears taken from menopausal women and women who had had hysterectomies or received radium therapy. Even during pregnancy, different patterns were found.

A further study of stained tissue obtained from the cervical glands by biopsy or from extirpated uteri was made. Here, too, although various patterns were found in the glands, no correlation could be found with the physiological status of the woman.

It was believed that these patterns, both in the mucus and in the glands secreting it, were related to the estrogen level or the estrogen-progesterone ratio. On the basis of this study, however, no such relationship was found to exist. Although certain patterns are found in greater frequency at certain times, all three grades of fern-leaf formation may be found under all hormonal influences.

L. B. WINKELSTEIN, M.D.

Meinrenken, H.: Acanthosis Nigricans and Papillary Ovarian Tumor, p. 1025.

A case of acanthosis nigricans, in combination with an ovarian tumor, is described. Skin changes, especially at the back of the neck, in the axilla, around the elbows, and around the external genitals, began five years before the gynecological diagnosis was made. These skin changes were typical of acanthosis nigricans. The patient was 26 years old and gave an average normal past history including a normal gynecological history. On examination a right ovarian mass was found, which on laparotomy proved to be an inoperable papillary ovarian tumor. The question was raised as to whether these two pathological conditions were concomitant, or whether, as pointed out in previously reported cases, there is an actual connection. Conjecture is also raised as to whether the skin manifestations are due to storage of ovarian hormones or whether they might be a hereditary trait.

L. B. WINKELSTEIN, M.D.

Kirchmair, Hans: Intrauterine Function of the Human Fetal Kidney, p. 1041.

There is no doubt that the placenta acts as an excretory organ for waste products developed by the human fetus during intrauterine life. Opinion is sharply divided, however, as to whether or not the kidney (metanephros) actually is a functioning organ

during the period of gestation. According to reports in the published literature this question has never been adequately or fully answered. The author, however, described from the physiological-pathological point of view a case which, he feels, holds the solution to the problem. A male child, of normal size and weight, was delivered at term, but lived for only one hour and twenty minutes. Death was ascribed to asphyxia neonatorum and possible intracranial hemorrhage. On postmortem examination, congenital infracollicular urethral stenosis was found. This was the result of the presence of two large developmental defects. Further findings consisted of hypertrophy, enlargement, and trabeculation of the bladder, hydroureter, and hydronephrosis. These entities could only be the result of the damming back of urine which was produced during fetal life. The author therefore feels that the kidney is an actual functioning organ during intrauterine life in the human fetus.

L. B. WINKELSTEIN, M.D.

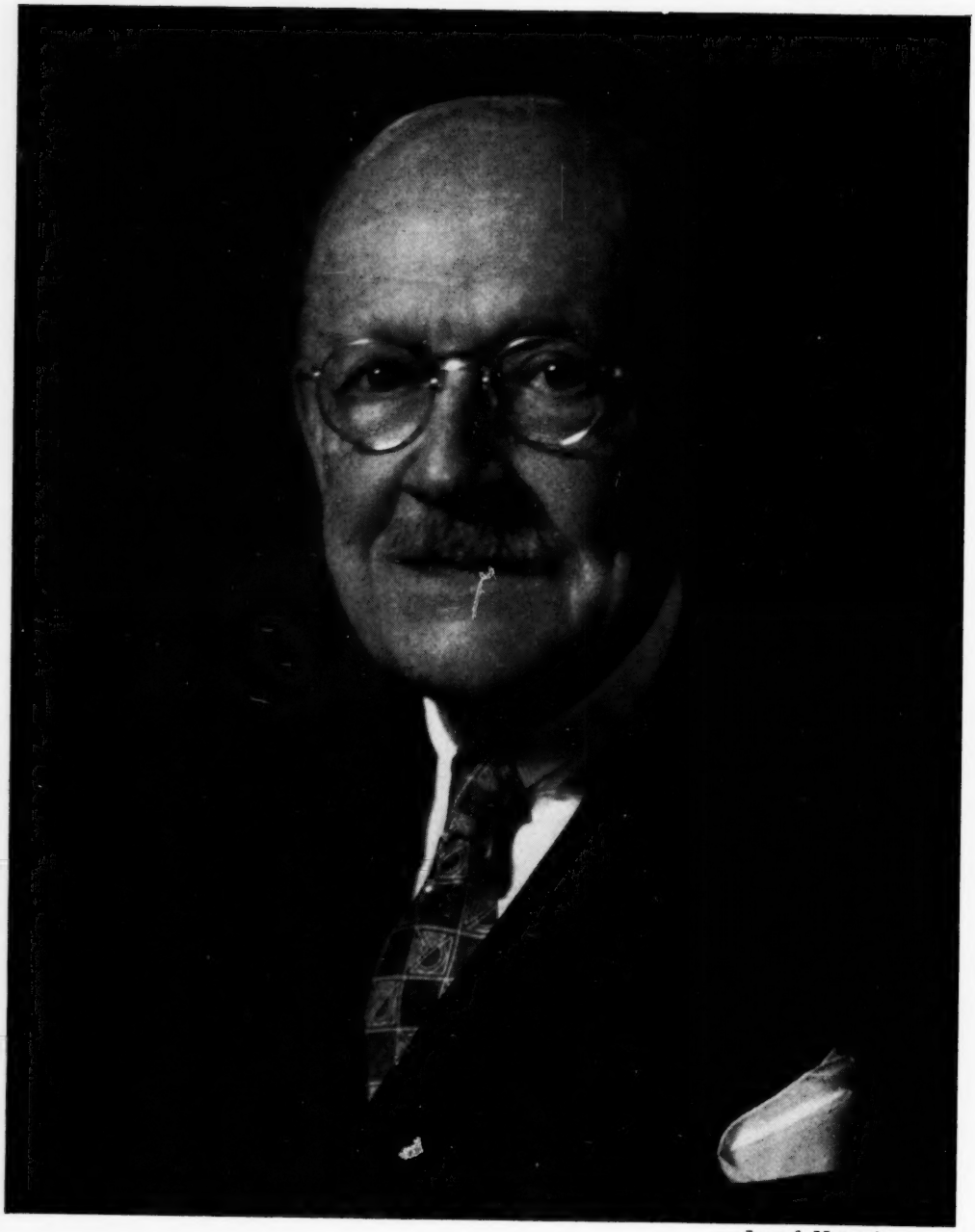
Zentralblatt für Gynäkologie

Vol. 75, No. 45, 1953.

Huber, L.: Hypervitaminosis of Vitamins A and C in Inoperable Female Genital Cancer, p. 1771.

Many European, and especially German, investigators have attempted to use huge doses of vitamin A and vitamin C as a palliative measure in the treatment of various types of inoperable or metastatic malignancies. Some, including von Wendts, have reported good results, not only so far as subjective complaints are concerned, but also in that useful life was prolonged. Hypervitaminosis was produced by the daily administration of from 300,000 to 600,000 I.U. of vitamin A together with 2,000 mg. of ascorbic acid. These doses were thought to prevent growth of the tumor masses. The author has attempted to evaluate such therapy in 25 cases of inoperable genital carcinoma which were managed under his personal supervision. Cases included 20 patients with Stage III and Stage IV cervical cancer; 4 women with widespread fundal carcinoma, and one case of papillary ovarian malignancy. After prolonged and critical observation of these 25 cases, conclusions are drawn that such hypervitamin therapy in no manner has any beneficial influence on the course or the severity of any of the malignant diseases of the female genital tract which were studied.

L. B. WINKELSTEIN, M.D.



Joseph Merante
New York

DR. GEORGE W. KOSMAK

In Memoriam

DR. GEORGE W. KOSMAK, editor of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, died on July 10, 1954, at his home in New York City. He had been ill for over a year from a gradually increasing myocardial insufficiency.

The readers of the JOURNAL have been for years conscious of Dr. Kosmak's contributions to the advancement of obstetrics and gynecology. A review of his accomplishments and a brief biography were published at the time of his eightieth birthday in the July, 1953, number of this JOURNAL.

The July, 1954, number had been prepared as a special tribute to him with contributions from many of the leaders in obstetrics and gynecology in the United States and elsewhere throughout the world. A copy of this number reached Dr. Kosmak barely a week before his death.

In a letter from Dr. Kosmak dictated to the editors after this number had been received there appears the following paragraph:

> It seems to me that what a man needs most at the end of a lifetime of service is not honors and tributes themselves but the sense of accomplishment these bring with them. As I look through the distinguished articles in the special issue of the JOURNAL which is dedicated to me, I am filled with a realization of the magnificent progress of obstetrics and gynecology in the last fifty years. My pride and satisfaction are not in my own small contribution but in the past and future of the profession to which I have been privileged to contribute.

Dr. Kosmak has written his own best final message.

The editors can add only an expression of deep sorrow and a reiteration of their sense of responsibility toward the work which Dr. Kosmak has created and left to be carried on.

The Editors

Items

The American Board of Obstetrics and Gynecology

The next scheduled examination (Part I), written examination and review of case histories, for all candidates, will be held in various cities of the United States, Canada, and military centers outside the continental United States, on Friday, Feb. 4, 1955.

Twenty case abstracts are to be sent by the candidate to the Secretary as soon as possible after receiving notification of eligibility to the Part I written examination.

Candidates are reminded at this time that application for re-examination in Part II must be made by the candidate prior to February 1 of any year.

ROBERT L. FAULKNER, M.D., SECRETARY
2105 Adelbert Road
Cleveland 6, Ohio

Fourteenth British Congress of Obstetrics and Gynaecology

The Fourteenth British Congress of Obstetrics and Gynaecology will be held in Oxford, England, July 27-30, 1955. For information write to

THE CONGRESS SECRETARIES
Radcliffe Infirmary
Oxford, England

New York Academy of Medicine Symposium on Cancer

Six authorities on cancer will participate in the 1954 A. Walter Suiter Lecture, Nov. 4, 1954, at The New York Academy of Medicine, on "Cancer: What We Know Today."

Topics and speakers will be:

"Changing Incidence of Cancer Over the Years." Harold F. Dorn, Ph.D., Chief, Office of Biometry, National Institutes of Health, Bethesda, Md.

"Multiple Views on the Causation of Cancer." Dr. Harold L. Stewart, Chief, Laboratory of Pathology, National Cancer Institute, Bethesda, Md.

"The Natural History and Diagnosis of Cancer." Dr. Lauren V. Ackerman, Professor of Surgical Pathology, Washington University, St. Louis, Mo.

"Modern Therapeutic Measures in Cancer and Their Effectiveness." *Surgery,* Dr. Owen H. Wangensteen, Professor of Surgery, University of Minnesota Medical School, Minneapolis, Minn. *Radiology,* Dr. Richard H. Chamberlain, Associate Professor of Radiology, University of Pennsylvania School of Medicine, Philadelphia, Pa. *Chemotherapy,* Dr. Alfred Gellhorn, Director, Institute of Cancer Research, Columbia University College of Physicians and Surgeons, New York, N. Y.

Dr. Robert B. Kennedy Honored

A testimonial dinner in honor of Dr. Robert B. Kennedy was held in the Grand Ball Room of the Statler Hotel in Detroit, Mich., June 30, 1954. The dinner was preceded by a reception. Over two hundred twenty-five friends, fellow physicians, and their wives attended the dinner, which was sponsored by Dr. Kennedy's former Residents, men who trained under him while he was serving as Chief of the Department of Obstetrics at Women's Hospital and St. Joseph's Mercy Hospital in Detroit.